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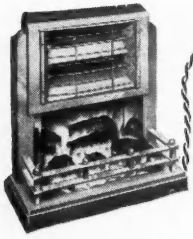

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ELECTRICAL REVIEW 22nd AUGUST, 1952

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. CLI • NO. 3900

Time for Action

THERE is a general impression in the electrical industry that while it is being "frustrated" on the domestic side the gas industry is going ahead unimpeded by Government frowns and active opposition by interested parties. It is consequently somewhat surprising to find some quite opposite views in "Thermfare," the journal of the British Gas Staff Association. This journal complains that the present recession in trade is being used as an excuse to cut down gas staffs. The Gas Boards are accused of contributing to the recession by "slow motion sales policies" and "Thermfare" goes on to say:—"Past experience tells us that what the electricity industry wants the electricity industry must have—and politically always gets it. It would be no surprise to us to hear any time now that the Fuel Ministry had been persuaded to lift the embargo on promotional selling."

This is sheer fantasy; our rivals are confusing what should be with what actually is. With the Ridley Committee's report in the offing there is little hope that the Ministry will concede what everybody in the electrical industry knows to be necessary. The trend of electricity sales shows clearly how effective the industry's negative policy, forced on it by power plant shortage, has proved. People have been told to keep off the peak and in consequence have tended to keep off the mains altogether. The legend of constant power cuts put over by the lay Press has scared off would-be consumers and their representatives on local councils. Naturally this has checked the upward movement of electricity sales which is the mark of progress in a civilized country.

Some effort will be required to restore the position to normal. Will the British Electricity Authority and Area Boards be allowed to make it? Will the Electrical Development Association be permitted to engage in development, rather than continue to act as a cautionary or advisory body? If restraint is continued and output falls the first result must be higher charges which would not only

handicap industrialists (when they are already complaining that prices are too high) but also add a point or two to the cost of living. This will further restrict consumption and set up a downward spiral or vortex.

In this business the manufacturers of electrical appliances are also deeply involved. They, at least, need not be intimidated by the Government. To arrest the decline in their sales they must be prepared to take "promotional" action. Individually many of them are already doing something to combat the anti-electric propaganda but a joint campaign would achieve better results. Such campaigns are expensive but acquiescence in the present position may be much more costly. The ideal arrangement would be a combined movement by the supply industry and the manufacturers—and the contractors too. This, however, is perhaps too much to hope for.

FIRE CAUSES

A random one-in-two sample of reports on fires attended by Fire Brigades in the United Kingdom during 1950 has been analysed. The result is summarized in tables in "Fire Research for 1951," to which report further reference is made on another page. It is thus revealed that out of 43,744 fires inside buildings that year, only 7,206 were attributable to electrical causes whereas 9,446 are said to have been due to open-grate ignition of materials. Twenty-two fewer supposed electrical fires occurred and of the 28,130 outdoor fires only 2,862 were believed to have been due to motors, wire, cables and other electrical apparatus.

REDUNDANCY

A threatened strike of employees of the London Electricity Board has not developed. The cause of the threat was the dismissal of a number of meter readers who were considered by the Board to be superfluous. It is clear that the Board (or any other employer for that matter) cannot indefinitely continue to employ people for whom no work exists. For the men concerned it is a serious situation if they cannot find alternative employment, but there is an inexorable economic principle involved. We can only hope that the Board will handle the matter as tactfully as possible and endeavour to find other, useful, work for those who are regarded as redundant.

FURTHER DISCUSSION

A serious situation has been deferred and, it is to be hoped, avoided by the decision of the Confederation of Shipbuilding and Engineering Unions to have further talks with the employers' organizations before taking steps to enforce the unions' claim for a £2 a week wages increase. It was made clear at the Southsea Conference that there were misgivings about the amount of the proposed increase: misgivings already felt by some of the unions' leaders who were stampeded into proceeding with the claim. Rejection by the employers was a foregone conclusion and it was complete; there was no counter-offer. If any increase is warranted it could certainly not be of this magnitude. It is possible that the manifestation by the unions of a more reasonable attitude may induce the employers to give further consideration to their case at to-day's meeting between the parties.

ELECTRICAL WHO'S WHO

The second edition of this useful reference book is now available. It contains brief biographies of over 4,000 men and women in all branches of the electrical industry and profession. Copies are obtainable at 12s 6d (postage 8d) from all booksellers or the Publishing Dept., Dorset House, Stamford Street, London, S.E.1.

Losses in Distributors

The Feeding of Mains Both Ways is Advantageous

By J. G. **BOGGIS**, A.M.I.E.E., Graduate I.Mech.E.

MODERATE accuracy is sufficient in the solution of most engineering problems. For the problems of voltage drop, load flow, and copper losses in electricity distribution networks, the accuracy of the exact methods is usually spurious. The simultaneous steady loads which must in practice be assumed for the purpose of calculation are not known and cannot be known. So many of the data have to be estimated, particularly when future loads are concerned, that it is pointless to seek precise solutions.

When loads are distributed along a line, or cable, the assumption is often made that they are uniformly distributed; this certainly makes the calculation easy. An assumed u.d. load can be replaced by a single point load (Fig. 1) at either one-half (for voltage drop) or at one-third (for losses) of the distributor's length. But this approximation can be a poor one, since the distribution of the loads may be seriously biased.

Ignoring the practical difficulties, if the actual distribution of the loads is known, the calculation of the voltage drop proceeds by the well-known method of taking moments about one end of the cable. A difficulty arises when the same procedure is attempted for the estimation of the losses. Obviously, the exact method becomes laborious with a large number of point loads; the computer is tempted to replace them with a u.d. load and, in an endeavour to correct any bias in the loading, he may place the equivalent point-load at an estimated position off-centre.

Here, another method of attacking this problem is suggested which gives moderate accuracy, allows for bias in the loading and is simple and easy to use.

Before outlining the approximate method, a few points in connection with the exact method require some explanation. In Fig. 2 the distributor *A–B* is fed at end *A*. At *B* the voltage drop is $(I_1 + I_2)R_1 + I_2R_2$, which can be written as $I_1R_1 + I_2(R_1 + R_2)$ volts. By analogy with the method of calculating bending moments, the above second expression can be called the *first moment* of the loads about *A*. Divide this moment about *A* by the total resistance $(R_1 + R_2)$ so that the result $I_b = I_1R_1/(R_1 + R_2) + I_2$ is the equivalent point-

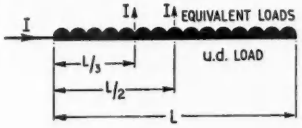


Fig. 1—Uniformly distributed load

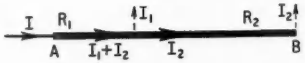
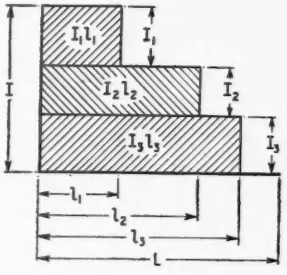


Fig. 2—Moment calculation



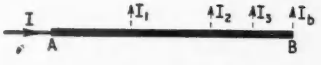


Fig. 3—Current/distance curve

load at B which will give equal voltage drop. An important conception is that so far as the conditions external to the distributor are concerned, the many loads can be replaced by loads at both ends (I_a and I_b) which, by analogy, are the reactions at the supports.

Unfortunately the method of moments cannot be applied to the calculation of losses. The reason is simply that $(I_1 + I_2)^2 \neq I^2_1 + I^2_2$ because the principle of superposition only applies to linear processes in which *effect* is directly proportional to *cause*. Otherwise the method of moments could be applied to the squares of the load currents. Also while I_b will correctly represent the voltage drop, or load flow, it cannot be used to calculate the losses in the cable.

Consider a distributor of uniform cross-section, L yards long, fed from one end. Working in amp-yards (Fig. 3) the moment about the supply end A is: $I_1l_1 + I_2l_2 + I_3l_3 + \ldots = \Sigma I_nl_n$ and $I_b = \Sigma I_nl_n/L$. From the shaded areas in the figure the total area is seen to be the first moment about the supply end. The problem is therefore to determine this area. Given many loads spaced along the distributor, the current/distance curve can be approximately represented by a smooth curve. That shown in Fig. 3 cannot be so represented, since it is far from smooth, but there is no need to use approximations for a few loads which are easily handled by exact methods.

The area under the approximating curve, a parabola for example, can be found and used as an estimate of the first moment. In Simpson's rule, which could be used for this purpose, the ordinates are spaced at equal intervals along the base line and the lengths of the ordinates are multiplied by unequal coefficients: 1, 4, 2, 4 . . . 2, 4, 1. Spacing the ordinates at unequal intervals so that the coefficients are equal gives formulæ which are convenient in use; these formulæ are due to Tchebycheff. In Fig. 4 the three-ordinate and five-ordinate methods are shown. The area is either $(y_1 + y_2 + y_3)/3$ from three ordinates at the positions shown, or $(y_1 + y_2 + y_3 + y_4 + y_5)/5$ from five ordinates—simply the arithmetic mean of the ordinates.

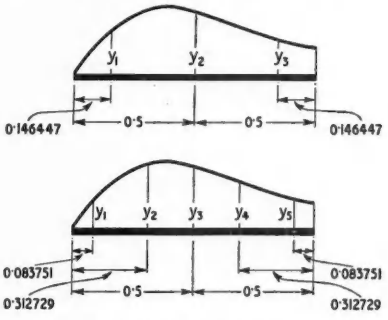


Fig. 4—Tchebycheff's quadrature rules

Exactly by the method of moments, the equivalent point load I_b for the example shown in Fig. 5 is 103 A. $\Sigma I_nl_n = 150 + 600 + 1{,}000 + \text{etc.} = 10{,}300$ amp-yards.
$I_b = 1/L\ \Sigma I_nl_n = 10{,}300/100 = 103$ A.
Using three ordinates, their positions are (for a 100 yard long distributor) at 15, 50, and 85 yards with sufficient accuracy. The currents flowing in the cable at these points are 150, 100, and 60A.

The mean value is 103·3 A (310/3). For this example the agreement between the approximate and exact solutions is good, but the method cannot be relied upon to ensure such close agreement. In Fig. 5 the approximating curve is shown, together with the areas (shown shaded) above and below it. These areas, considered as positive and negative errors, should cancel out for an accurate result.

Having obtained the equivalent point-load at B, either exactly or nearly, load flow and voltage drop are easily calculated. Since the sum of the equivalents is equal to the total load, I_a can be found from I_b. These equivalents are used as follows:

(i) I_a determines the voltage drop when the main is supplied at B end.
(ii) I_b determines the voltage drop when the main is supplied at A end.
(iii) I_a and I_b are the divisions of the total load between the respective ends when they are at equal voltages (ring-main).
(iv) When the main forms part of a network the methods of network analysis can be applied to the equivalent main which carries loads at its ends only.

To indicate the errors which arise when the three-ordinate rule is used, the loads on the distributor of the previous example were removed one at a time and the results

noted (Table I) while, for comparison, the exact values and u.d. load values are also given. It can be argued that these errors are excessive; it is admitted that even greater errors may arise, but the object of the approximation is to avoid the labour of the exact method without making the sweeping assumption of the u.d. load.

Table I : Comparison of Exact and Approximate Methods, see Fig. 5

Load Removed		Equivalent point load at *B* in amps.		
No.	amps.	Exact	3-ord.	u.d.-load
Nil	—	103·0	103·3	77·5
1	10	101·5	101·7	72·5
2	20	97·0	96·7	67·5
3	25	93·0	95·0	65·0
4	10	97·5	96·7	72·5
5	30	80·5	83·3	62·5
6	50	55·5	53·3	52·5
7	10	93·0	93·3	72·5

Generally, the three-ordinate rule will give results which are in error by a few per cent with a maximum of about ten per cent. It is remarkable that with such limited information, the currents at only three points, the approximation should be reasonably close.

Sometimes a smooth load distribution may be marred by one or two prominent loads; it is helpful to observe that these loads are correctly dealt with by the rule when they are at, or near, these fractions of the length: 0, 1/3, 2/3, 1 and when they are at, or near, the ordinates, the accuracy suffers. When a point load coincides with an ordinate the mean of the currents on either side of the point will give better accuracy; in Fig. 5 the first load coincides with the first ordinate and therefore $(155 + 145)/2 = 150$ A is used in the computation.

To determine ΣI^2R, where I is the current in the main, it is necessary to sum the losses in the lengths of the main between service tappings. If the main is supplied at both ends the division of the total load (I_a and I_b) must first be found. Repeating the procedure for the computation of the first moment by the three-ordinate rule, equivalent loads are found which give equal copper losses: these are denoted by I'_a and I'_b.

$\Sigma I^2R = 1/3(I^2_{15} + I^2_{50} + I^2_{85})R$ total watts, approximately. The subscripts 15, 50, and 85 indicate that a 100-yard main is to be cut at those lengths and ammeters inserted.

$I'_b = \sqrt{[1/3(I^2_{15} + I^2_{50} + I^2_{85})]}$ = r.m.s. value of ordinates. Compare with: $I_b = 1/3(I_{15} + I_{50} + I_{85})$ = arithmetic mean value of ordinates.

Again using the same example (Fig. 5) the working is: $(I'_b)^2 = 1/3(150^2 + 100^2 + 60^2) = 1/3(36{,}100) = 12{,}030$. Taking the square root, I'_b is approximately 110A, which agrees closely with the exact value of 110·2A. Having obtained the equivalent load, the losses are quickly calculated from $(I'_b)^2 \cdot$ (total resistance) watts. The merit of this method is that charts and nomograms prepared for single loads can be used. The whole calculation of voltage drop and copper losses can thus be reduced, at least for the straightforward cases, to a simple routine. Using the exact methods, without a calculating machine, the problem should be solved by two independent computers if the results are to be relied upon; the approximations do not need elaborate checks.

In the same way I'_a can be found, but the sum of these equivalents is *not* equal to the total load. It is convenient to set out the working as follows; voltage drop and losses are found by a single calculation. Using three ordinates and considering the main supplied from *B* end:

I_{15}	= 95	I^2_{15}	= 9010
I_{50}	= 55	I^2_{50}	= 3030
I_{85}	= 5	I^2_{85}	= 25
Sum	= 155	Sum	= 12065
I_a	= 51·7A	I'^2_a	= 4022

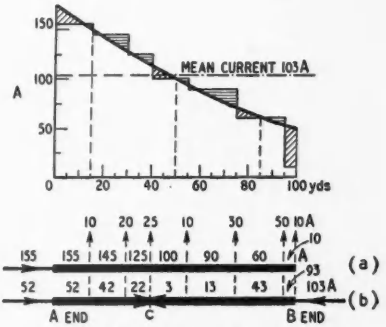


Fig. 5—Example solved by approximations

Now for a balanced three-phase load the losses are $3I^2R$, but in the course of this calculation the value of $3I^2$ has been determined as 12065. (It is assumed that the loads are at equal power-factors so that the problem may be treated as if the supplies were d.c.)

If the distributor is supplied from both ends with equal voltages, the current $I_a = 51{\cdot}7$A is supplied from *A* end; superposing it on the values given above (95, 55 and 5A) the ordinates become:

I_{15}	$=95-51{\cdot}7=$	$43{\cdot}3$	$I^2_{15} = 1850$
I_{50}	$=55-51{\cdot}7=$	$3{\cdot}3$	$I^2_{50} = 9$
I_{85}	$=5-51{\cdot}7=$	$-46{\cdot}7$	$I^2_{85} = 2210$
Sum =	. . .	00·0	Sum = 4069
			$1/3 \cdot$ Sum = 1360
			$= I'^2_{ab}$

The first moment should, of course, be zero because it represents the voltage drop between the ends.

It is interesting to collect and compare the three results for copper losses. For $R_{ab} = 0{\cdot}1$ ohm and a balanced three-phase system the losses are: 3·6 kW when supplied from *A*; 1·2 kW when supplied from *B*; and 0·4 kW when supplied from both ends. Interconnection of distribution networks, instead of operating the network as "radials," is, as this example shows, of great value in reducing losses. Since every kilowatt saved in losses is tantamount to an increase of one kilowatt in the generating and transforming capacity, the advantages to be gained by feeding mains both ways should not be overlooked.

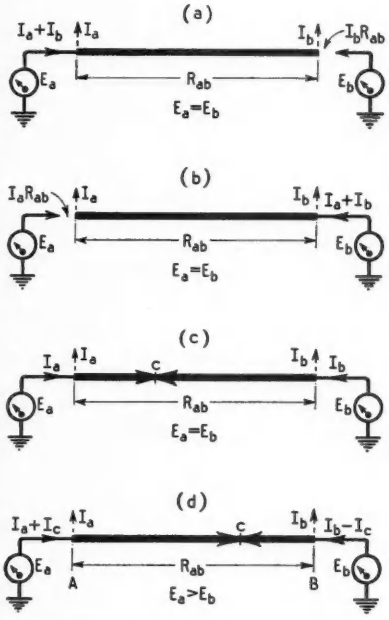


Fig. 6—Notation

Division of the total load between the supply points when they are maintained at equal pressures is, as previously stated, I_a from *A* and I_b from *B*, obtained from a first-moment calculation. Having found these load divisions, the current at any point along the main is determinable; see Fig. 5(*b*). To arrive at the maximum voltage drop the point at which the direction of the current changes must be found; this rule is perfectly general and is not restricted to the case of equal voltages. The rule is analogous to the method used to find the point of maximum bending moment by finding the point of zero shear force. This point is marked in Fig. 6.

With unequal supply voltages $E_a \neq E_b$, a circulating current (denoted by I_c) flows along the main. For voltage determination the first moment due to this current is merely added to the previous result, i.e., the principle of superposition applies.

Since that principle cannot be applied to loss calculations it would appear to be necessary to repeat the loss calculation for every case. That is not so. Owing to the ease with which results are obtained by the approximate method, the discussion which follows is hardly relevant when approximations suffice; but when exact methods are in use laborious repetition of the computation can be avoided.

Consider a distributor which was carrying loads of I_1, I_2, and so on. Note that the notation has changed since I_n now denotes the current in the main and not as before the current in the service tapping. The losses were $I^2_1R_1 + I^2_2R_2 + \ldots + I_{n_2}R_n$ watts. Now superpose a current I_c which flows the whole length of the main. The losses will be $(I_1 \pm I_c)^2R_1 \ldots + (I_n \pm I_c)^2R_n$ watts: which on expansion becomes:
$I^2_1R_1 + \ldots + I_n{}^2R_n + I_c{}^2(R_1 + \ldots + R_n) \pm 2I_c(I_1R_1 + \ldots + I_nR_n)$.

For the important case of zero first moment (the case of equal voltages before

superposition of the through current) the final term becomes zero. This means that if the losses for the equal-voltage case are known then the losses caused by unequal pressures are found from $I_c^2R_{ab}$ (Fig. 6(*d*)) and the two combined. By reasoning along these lines a number of relationships can be found which connect the equivalent currents, for the various supply end-conditions.

Relationships

$I_a + I_b$ = Total load $= I'_a + I'_b$
$I'_a{}^2 - I_a{}^2 = I'_b{}^2 - I_b{}^2 = I'_{ab}{}^2$
$I_c = (E_a - E_b)/R_{ab}$
Losses $= I'_{ab}{}^2 \cdot R_{ab} + I_c{}^2 \cdot R_{ab}$ watts
See Fig. 6.

In these formulæ the symbols denote:

I_a, I_b equivalent currents for voltage drop calculations;
I'_a, I'_b equivalent currents for copper loss calculations;
I'_{ab} equivalent current for losses when the main is supplied from both ends at equal voltages;
R_{ab} total resistance between the ends *A* and *B*.

Finally, a warning is given that the approximate methods, in common with other approximations which are widely used in engineering practice, must be used with prudence.

Bibliography

T. F. Wall, "Principles of Electrical Engineering," Newnes.

E. Whittaker and G. Robinson, "The Calculus of Observations," Blackie & Son.

New Books

Electrical Instruments and Measurements. By W. Alexander, M.Sc., B.Sc. (Eng.), M.I.E.E. Pp. 352; figs. 112; index. Cleaver-Hume Press, Ltd., 42a, South Audley Street, London, W.1. Price 12s 6d.

The object of this book is to provide students of about National Certificate standard with an insight into the theory and operation of the indicating instruments commonly encountered in electrical engineering. A detailed description is given of the construction and characteristics of moving coil, moving iron, thermal, dynamometer and electrostatic types of movement, together with a discussion of the scale shape and ranges associated with each type. Attention is then directed to the measurement of power, and the more involved parameters—phase, power factor and frequency, using direct reading instruments.

Two chapters are devoted to domestic energy meters and the special types required for charging industrial consumers on a two-part tariff. The remainder of the book deals with the standard methods of calibrating instruments together with sections on resistance, insulation and installation testing.

The text, which is essentially non-mathematical and easy to read, is particularly suitable for private students in that the author has provided a number of test questions and answers for each chapter. The title of the book is perhaps badly chosen as the author has concentrated almost exclusively on deflectional instruments and, with the exception of the d.c. potentiometer and Wheatstone bridge, has ignored the many null methods of measurement, although their inclusion would inevitably have increased the cost and bulk of the book.—H.B.W.

Transmitting Valves. By J. P. Heyboer and P. Zijlstra. Pp. 284; figs. 256; index. Cleaver-Hume Press, Ltd., 42a, South Audley Street, London, W.1. Price 35s in the United Kingdom.

This book was written in 1944 but J. P. Heyboer was executed by the Germans and the manuscript was prepared for publication by his colleagues in 1946. P. Zijlstra has made a thorough revision for the present edition, but has not attempted to include any valves or circuits in which transit time effects are important.

The title is misleading because the authors give almost no account of the valves themselves. The book is actually concerned with transmitter circuits and

begins with a chapter on the triode as an r.f. amplifier which is followed by a chapter on tetrodes and pentodes for the same service. Next comes a chapter on modulation, one on transmitting valves as oscillators followed by an account of frequency multiplication.

Miscellaneous problems such as grid emission, a.c. heating circuits and static measurements are then dealt with. The book concludes with a few pages on v.h.f. circuits and appendices on class A and class B operation.

The book is disappointing. The main difference between receivers and transmitters is one of scale, and it was hoped to find a good description of the techniques necessary when high voltages and currents are used. In fact, there is little material here which will not be found in any good text-book on radio engineering. There is little information on practical details: for example, the section on oscillators gives no details of the design of the grid circuit and bias arrangements. There are no references to other books or original papers. The book is, however, a good straightforward treatment of the theoretical problems considered.—A.H.B.

Alternating Current Machines. By H. Cotton, D.Sc., M.I.E.E. Pp. 303; figs. 160; index. Cleaver-Hume Press, Ltd., 42a, South Audley Street, London, W.1. Price 10s 6d.

This is another of the excellent books in the Cleaver-Hume Electrical Series written by Professor Cotton, who is not only a recognized authority on the subject of alternating current machinery but also the general editor of the series. The book is written particularly for the practical electrical engineer who has to deal with alternators and a.c. motors in his daily work, the assumption being that such men have little or no knowledge of the higher mathematics upon which a.c. theory is usually based. The author has therefore developed a purely physical conception of the rotating magnetic field with the aid of nothing more difficult than a progression of simple vector diagrams. This original treatment of what is often regarded as a difficult problem should be welcomed by teachers and students alike and it should prove helpful if it is studied before the more normal mathematical treatment.

Thence, after dealing with the alternator and its characteristics, the various forms of a.c. motor are examined, comprising the polyphase induction motor, the synchronous motor and the synchronous-induction motor followed by polyphase commutator motors and single-phase motors. There is also a chapter on rotary convertors which includes a brief reference to the mercury arc rectifier.

The book is fully illustrated by photographs and detailed drawings of machines made by famous British firms and, while the treatment is simple, it can be recommended not only to the elementary student but to those taking the more advanced courses as well as to practising engineers who are desirous of revising the fundamentals of their subject.—A.R.

Radio Interference Suppression: as applied to Radio and Television Reception. By G. L. Stephens, A.M.I.E.E. Pp. 132; 65 diagrams and photographs; index. Published for *Wireless World* by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 10s 6d.

This is a second edition of a book which first appeared in 1939. But for his untimely death, the original author would doubtless have carried out the revision which has been necessitated by subsequent developments. The present author did not set out to make an academic treatise of it; he has produced a practical handbook which is an up-to-date guide to all who encounter interference in its many forms, from design engineers who try to ensure that new equipment will be interference-free to service engineers who have to cope with specific cases.

The book describes in detail the origins of interference and the theory of methods of its suppression, with many instances of practical applications. Typical interfering appliances are discussed while particular attention has been paid throughout to interference at television frequencies and to suppression arrangements on motor vehicles and on board ship. There are other chapters on the design and choice of suppressor components, methods of determining the source of interference and suppression at the receiver itself. The first appendix deals with the measurement of interference and others contain useful reference data and a short bibliography of the subject.

Nationalized Customers

Revision of Selling Methods

By M. C. BLYTHE, A.M.I.E.E.*

THE two great industries—coal and electricity—are constantly before the public eye but they are usually thought of as producers of a basic commodity, or as a vital force in the arms drive, or perhaps as employers of a large labour force. It is not often that they are presented in the role of customers. Yet to many electrical engineering firms they are, above everything, very important customers whose whims and fancies, needs and troubles, must be carefully studied. It is therefore small wonder that the enormous upheaval of nationalization brought some alarming possibilities as a result of complete change of character of the executive core of the industry, whose job it is to decide the type of plant best suited to its needs.

Central Purchasing

Purchasing power, hitherto in the hands of many executives all acting independently for separate undertakings, could now be concentrated in one central purchasing department. Engineers and managers who had placed business with certain firms for many years might now have no power to place any orders. Others who now had broader powers might take away business from firms who had considered themselves well established. Large bulk orders might be negotiated and price competition forced so much that the successful tenderer might fill his factory and empty his pocket while the unsuccessful had nowhere to turn for alternative orders. Added to this a drive for standardization might exclude some designs completely from any possibility of further use over wide areas.

All these things did happen to some degree but, although the effects were felt and some hardship did occur, the damage was much less than it might have been because of market conditions at the time. Demand for engineering equipment was high and home requirements coupled with an active export market were more than the industry could supply.

The result was that although undoubtedly Firm "A" lost considerable business on switchgear because for various reasons certain Area Boards decided to standardize on other makes, it soon found an alternative market for its gear which could now be offered on quicker delivery. Similarly, Firm "B" lost a good customer for mining transformers because the executive now responsible for purchasing has different ideas. However, it found that this released capacity for making distribution transformers and it soon filled up its order book.

It was therefore most fortunate for the manufacturers that two industries with such large purchasing power were nationalized at the time of a sellers' market and that such conditions have persisted with periodic fluctuations until now. It has given a very useful breathing space during which both sides have been able to take stock of the position.

Changing Market Conditions

But the condition cannot last indefinitely and it may not be long before the effect of nationalized customers in a keen competitive market such as we had in the 1930s is demonstrated in practice. It is important now to weigh up the position and study carefully the character of the new giants and how they are likely to react.

As compared with the former separate and smaller entities the nationalized customer has two outstanding differences. It has much more special knowledge and is much slower in taking action. These qualities are particularly marked in the Electricity Board where experts are called in to deal with problems on their special subjects. Discussions must therefore be on a high technical level although the commercial side may be run by a non-technical purchasing department.

This very fact of calling others to advise before a decision is made contributes to the

* Mr. Blythe is manager, North East England, for the Brush Electrical Engineering Co., Ltd.

second quality of slowness in action. So many people have to be satisfied, there are so many angles to watch, committees to consider and so on, that a decision takes a long time and there is great temptation to do nothing rather than attempt action, even in a good cause. This great inertia of large organizations is of course well known and welcome signs are evident that steps are being taken by means of decentralized control to reduce the effect. However, there is at present, and is likely to be for some time, much sharing of responsibility, much paralleling of control and linking of authority which must be carefully studied and appreciated by those who seek to serve these large concerns.

Close Co-operation Needed

There is little doubt that close co-operation between manufacturers and industry can be of immense help to both provided it is carried out with the right people in the right spirit. The whole problem of this liaison must be carefully studied so that efforts may be fruitful and of benefit both to customer and supplier. In most firms the responsibility for this liaison work rests with the sales department and technical representatives are in constant touch with the executives concerned with the product.

It is the technical representative who is an all-important link. First and foremost he must be acceptable to the appropriate executives so that he can negotiate without friction and argue without ill-feeling. He must know the individuals well enough to appreciate how far each can go towards influencing a decision and just what kind of action can be expected and how far it can make itself felt. He must have the right background to discuss the technicalities of their problems and be quick to see a solution which his products might give or might be made to give.

Steering a Middle Course

While on the one hand he must appreciate the problems and sympathize with the points of view of his customers, on the other hand he must uphold the opinions and recognize the difficulties of his firm. That is not to say he must be constantly vacillating and agreeing with everyone. On the contrary he must have firm opinions but he must needs steer a middle course which will be of benefit to both sides and satisfy everyone concerned.

There is no doubt that much effort is wasted by not knowing the customer well enough. Bright ideas have been developed and put into production only to meet with a complete lack of enthusiasm from those who were expected to welcome the new product. On the other hand, close contact between manufacturer and user often produces important improvements which are valuable contributions to efficiency.

Thirteen years of sellers' market has pushed sales departments into the background. Drones, say managements, are not wanted in a hive so full of work. But when, in the engineering profession, the outside man comes into his own again, let him study carefully the nationalized industries. Let him keep himself on a higher level than that of a mere salesman. In fact let him not sell but so co-operate, understand and assist his customer and so guide and advise his own firm that the orders come more as a natural and inevitable consequence than the uneasy result of much high pressure and forced argument.

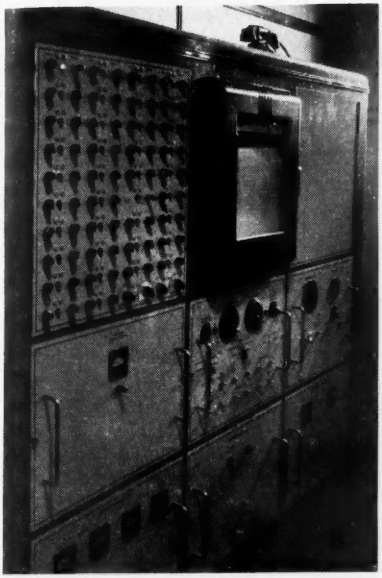
South African News

IN a paper read to the South African branch of the Institution of Production Engineers on electric cable manufacture, Messrs. G. Yates and D. A. Holt stated in regard to technical control and development that an efficient technical department was indispensable to achieve adequate quality control in an industry utilizing so many different materials and processes, and to have the means of carrying out development work in a field which is unlimited in scope. This was particularly the case in South Africa, where manufacturers who had been given permission to apply the South African Bureau of Standards mark had their products checked regularly by the Bureau's testing organization, to ensure that they were working to minimum quality standards. The functions of the technical department in a cable factory could be summarized as follows: (a) The maintenance and improvement of the quality of all products manufactured in the factory; (b) the development of new and existing processes, new materials and new cable designs; (c) representation on technical committees such as those of the South African Bureau of Standards; (d) the supplying of technical information to customers; (e) general technical work for the factory.

During March, 1952, 1,048 million kWh were generated in the Union by the larger undertakings, compared with 932 million kWh during the corresponding month of the previous year.

American Scientific Equipment

Technical Assistance for British Laboratories

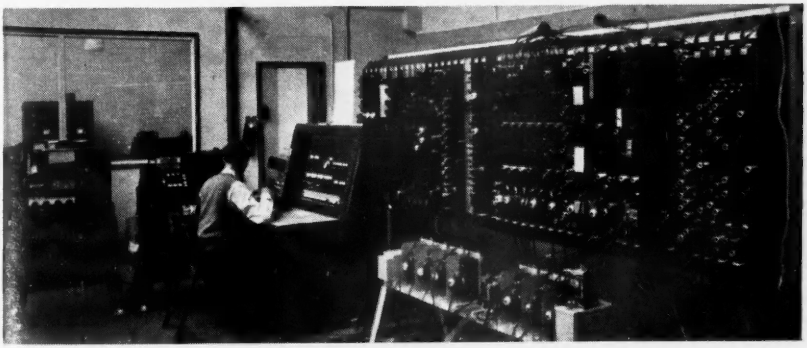


Production control quantometer for extremely rapid spectrographic analysis of non-ferrous metals

MR. W. L. BATT, Minister in charge of the Mutual Security Agency (M.S.A.) Mission to the United Kingdom, has released a partial list of investigational and testing equipment worth more than a million dollars (£350,000) supplied since 1949 to laboratories in Britain by the United States Government under the technical assistance programme of the Marshall Plan, authorized to be made available from American funds through E.C.A. (now M.S.A.) for research purposes.

Some of this equipment is obtainable only in the United States and, because much is highly specialized, some time will elapse before all of it is delivered; about three-quarters has been received and some is already in use. The "screening" of requests for this equipment has been done by the Department of Scientific and Industrial Research and, apart from the D.S.I.R. itself, allocations have been made to 24 research bodies representing a wide cross section of the major British industries.

For instance, the Production Engineering Research Association is to receive a variety of equipment to facilitate the investigation of machine tool problems. The British Cast Iron Research Association, the British Non-Ferrous Metals Research Association and also the British Welding Research



"Mega-Sweep" and "Megapulser," which are being used in the development of computing equipment at the N.P.L.

A feature of this strain indicator is its portability and robustness; here it is shown set up for tests on a beam for a model floor

Association have received a number of important items.

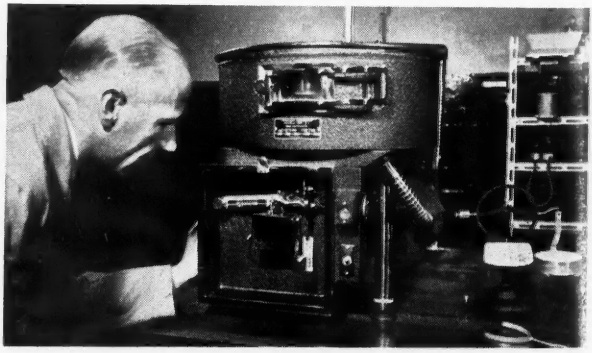
Of particular interest are the multi-channel direct reading spectrographs received by the Cast Iron and Non-Ferrous organizations which represent a major advance in scope, speed and accuracy upon existing rapid analytical instruments. In general this kind of direct recording employs multiplier photo-cells to measure the quantity of light emitted at different wavelengths in the spectrum, pre-selected in accordance with the requirements of the analysis. For some analyses the accuracy of the direct reading method is said to be almost twice as good as with photographic methods. A complete analysis for several elements can be made in two or three minutes from the receipt of the sample and, among other things, this method enables molten metal to be analysed before it is poured, thus allowing time to correct any errors.

The Welding Research Association has received a Tukon tester with accessories for the automatic determination of hardness numbers. The National Physical Laboratory has obtained a set of valves for the construction of instruments for calibration within the 2,660–10,000 Mc/s frequency range, thus filling in gaps for which no equivalent British valves are available. A Carey recording spectrophotometer has also gone to the N.P.L. for research into methods of measuring radiation in the ultra-violet range; it has permitted tests of interference filters, which used to last four days, to be accomplished in fifteen minutes. The possibility is being considered of adapting this instrument to microspectrophotometry; if this can be done it will facilitate original research which should be of value to those concerned with medicine.

Arc lamps have also been provided for use as a point source of light for the testing of optical equipment and the N.P.L. work on standards of measurement will be assisted by the acquisition of K-band klystron oscillators and crystal detectors which will aid in the very accurate measurement of short distances by the employment of a wavelength of light as the standard. With the help of this equipment the N.P.L. is hoping to devise an analogous method of determining long distances more accurately than is possible at present.

" Fosterite " material is helping in the investigation of photoelasticity by the " frozen stress " method, which is relatively new but promises to be a simple means of estimating stresses in connection with the design of mechanical machine parts. Condenser microphones with pre-amplifiers will facilitate the determination of standards of frequency in the audible range and the measurement of industrial noise for the

Moisture tester for semi-automatic coal sampling which can finish a complete test in the time normally needed to weigh a set of samples



study of sound proofing. A reflectoscope is being used to detect flaws in materials, the results being shown electronically, in cases in which orthodox methods of testing are impracticable. The Electronics Section of the N.P.L. is making good use of a " Mega-Sweep " and a " Megapulser " in the development of counting equipment. A typical use of the former is for adjustment of the mercury delay line amplifiers associated with the " ACE " automatic computing engine in the Mathematics Division.

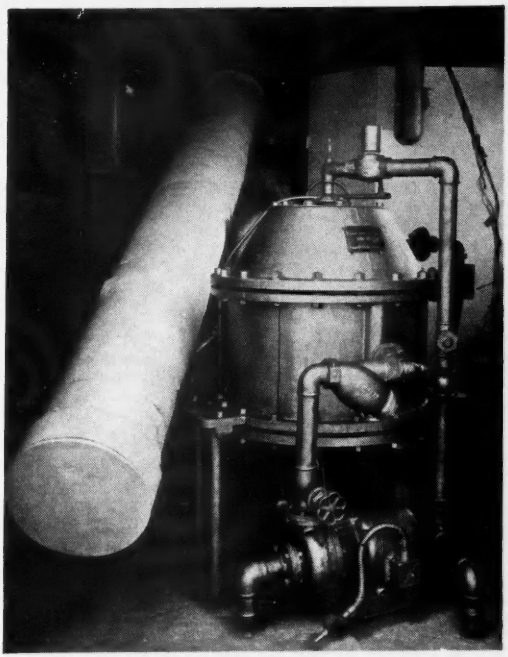
Among items received by the Mechanical Engineering Research Organization are two Marchant machines for carrying out the heavy calculations involved in research into the thermodynamic properties of steel as well as into the properties of other possible working fluids than steam.

The Building Research Station of D.S.I.R. is in possession of a portable strain indicator which can readily be carried round buildings and, if necessary, be used when working on a ladder. It has already been used for measurements on steel piling at the Battersea power station. Other equipment going to this laboratory includes an electric strain meter and an electric hygrometer to be used in connection with extensive trials of the heating and insulation of buildings.

American " trafficators " with magnetic counters and accessories will help the Road Research Laboratory when making traffic censuses. A semi-automatic moisture tester at the Fuel Research Station of D.S.I.R. will be used to determine the water content of samples of coal and will enable a complete test to be finished in the time hitherto required to weigh samples. The instrument, which accommodates ten specimens at a time, is very simple to operate.

The Electrical Research Association needed for its experimental heat pump at Reading a small thermostatic expansion valve which was not readily obtainable in this country. A suitable valve has been obtained from the United States for use with Freon-12 which has an actual capacity of 12 tons when used with a suction temperature of 20 deg F, a condenser temperature (saturated inlet liquid) of 140 deg F and a capillary length of 60in. This valve is used with a pump which is extracting heat from the soil and is probably the largest of its kind yet built in the world. Some 500ft of galvanized iron pipe in series with a 4,500 gall tank are buried just below the surface of the ground. To prevent freezing in cold weather calcium chloride brine is used.

The installation, driven by a 10 h.p. motor, has been working for some time and it is consistently providing heat equivalent to 30 h.p. which is used experimentally for warming one of the E.R.A. laboratories at Reading. It was in operation throughout last winter and it maintained its efficiency even when the soil temperature dropped to 26 deg F. A special transducer valve has been successfully incorporated in a gust recorder



This E.R.A. heat pump, for which a special valve was sent from the United States, is probably the largest yet built to use the soil as the source of low-grade heat

associated with the E.R.A. windmill electricity generator installed in the Orkney Isles.

The Chemical Research Laboratory of the D.S.I.R. has obtained a Mueller bridge for the fine control of temperature in connection with purification of chemicals. Another item is a low voltage multi-source of excitation for the investigation of spectral sensitivities. Some of the latter are greatest under arc-like and others under spark-like conditions. This device, by permitting rapid change from one extreme to the other, allows speedy determination to be made of the most favourable type of discharge for a particular analytical problem and, furthermore, the maximum power obtainable by its use is much greater than that of any unit available commercially in this country, thus considerably increasing the sensitivity of analysis carried out with its aid.

An isodynamic separator is being employed in connection with the raw materials of atomic energy. Previously no equivalent laboratory magnetic device has been available for the separation of monazite from crude sands. Adjustment in accordance with the mineral being separated is made by tilting or turning the head of the machine and adjusting its field strength.

Textile equipment has also gone to the Shirley Institute in Manchester, the Wool and the Linen Industries Research Associations; also to the Radio Research Organization, the Pest Infestation Laboratory and the Scientific Instruments, the Motor Industries, the British Food Manufacturing Industries, the British Boot and Shoe, the British Jute Trade, the Leather Manufacturers', the British Paint, Colour and Varnish Manufacturers' and the Printing, Packaging and Allied Trades Research Associations.

Transmission Problems

A Discussion of Economic Aspects

IN a study of the economics of high voltage transmission contributed to *Electrical West*, Professor E. C. Starr (Oregon State College), consulting engineer to the Bonneville Power Administration, discusses the costs of transmitting power for 200 miles at 75 per cent load factor under three conditions. Two are for 230 kV when using steel-cored aluminium conductors of 500.000 and 1,240,000 circular mils (copper equivalent), the third for 345 kV when using the larger conductor with auto-transformers at both terminals to link up with an existing 230 kV system.

Professor Starr concludes that for peak loads up to 180 MW, overall expenditure is least at 230 kV with the smaller conductor, which gives a line voltage angle of 35 deg, the maximum stable value when terminal impedances are somewhat higher than normal. From 180 to 280 MW, the larger conductor at the same voltage becomes the most economical, but above 200 MW with normal terminal impedances series-capacitor compensation would be required.

When the system is of a size to permit the transmission of 300 MW without serious disturbance in the event of the loss of the circuit, 345 kV with the large conductor gives best overall results; it could be loaded to 350 MW without series-capacitor compensation or to 500 MW with such compensation at a cost of 75 per cent of that of the cheapest 230 kV line. Minimum basic insulation levels are adopted for economy, which implies the solid earthing of transformer neutrals to provide adequate protection against lightning and overvoltages.

In all cases the customary practice of raising the sending voltage by 5 per cent above normal is regarded as wasteful. Minimum reactive kVA at the receiving end is required when the voltage there is 85 per cent of normal, but losses are then unduly high. Increasing the receiving voltage above 85 per cent calls for more reactive kVA at that end, but releases more than an equal amount of reactive input to the sending end. Efficiency continues to improve with the receiving end voltage up to 10 per cent above normal. All the reactive capacity needed at the receiving end can be obtained from switched capacitors and a negligible amount of lagging reactive kVA is required to hold the voltage down to the operating level at light loads, minor corrections being obtainable by on-load tap-changing equipment.

VIEWS on the NEWS

By REFLECTOR

SCOTLAND'S anxiety to secure independence of England in as many directions as possible extends to electricity. Since nationalization Scots have complained that they have been bled electrically and financially for the benefit of those south of the border and a demand for electrical autonomy has arisen. But even if this were achieved it is doubtful whether the Scots would be happier. A rumour that the Government proposed to set up a single electricity board for the whole of Scotland brought immediate protests from the Highlands that they were not going to allow the Hydro-Electric Board to be submerged in any new body. Thereupon it was explained (quite unofficially I believe) that this was not the intention; the Board would remain independent and only the two southern areas would be involved. I can now imagine a controversy arising between east and west: Edinburgh being determined not to be subordinate to Glasgow or vice versa.

* * *

One argument in favour of transmitting electricity rather than transporting coal is the loss from overladen coal trucks during transit and shunting. If a report in the *Manchester Guardian* is to be believed, British Railways would probably suffer not only a loss of freight revenue by the change but also the benefits derived from stray coal. It was said by a farmer at a National Farmers' Union meeting that B.R. had collected 55 tons of sugar beet from its sidings and had sold them to a beet sugar factory at the current price of between £5 and £6 a ton. The speaker rightly said: "It is an extraordinary thing that the Railway Executive should do this," but I suppose the beet were regarded as unclaimed lost property.

* * *

Some notes upon the introduction of electricity into Luton appeared in a recent issue of a local newspaper. After mentioning that the original supply was d.c. and prospered exceedingly, the writer said that later a new current called alternating current was discovered and wires were laid through the town to supply it to most people who wanted it, and that prospered too. Moreover "some people put in the new as well as the old." But since nationalization "we can't use any more of the original direct current and the folk who have been prudent in putting in both direct and alternating current and stand-by services must now pay a much higher price than they did before." How can these queer ideas be combated?

* * *

Considerable economy in cable and conduit results from the use of ceiling switches instead of wall switches and of course they are much safer in "earthy" situations such as bathrooms. This is the theme of an article I have read in "The Crabtree" (J. A. Crabtree & Co.'s magazine). For the ordinary room it is suggested that the switches should be fitted near the door at about 12in from the lintel, 6in clear of the swing of the door and with the end of the cord about 6ft 4in from the floor. This sounds satisfactory but it would require a little practice to find the cord in the dark; perhaps a luminous button would help. The point is referred to: the inconvenience is thought to be outweighed by the avoidance of the finger prints which often disfigure the neighbourhood of a wall switch.

* * *

Objecting (on the score of cost) to the use of heavy-gauge screwed conduit for electrical installations in the Caterham and Warlingham Council's new houses, a councillor sarcastically suggested that the walls should be lined with marble and that the floors should be of ebony. These refinements might, however, be more appropriate with a less-safe installation, being more immune to the effects of "the fusing of an electric wire."

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE *Electrical Power Engineer* reports that at a meeting of the National Executive Council of the Electrical Power Engineers' Association the matter of a successor to **Mr. J. F. Wallace,** general secretary, who retires at the end of the year, was considered. It was decided to take steps to appoint a new general secretary as from 1st January next at a commencing basic salary of £1,573; to ask each Divisional Council to nominate a candidate; and to recommend **Mr. H. Norton,** the present deputy general secretary, to the Divisional Executive Council as a suitable nominee for the office of general secretary.

Mr. H. S. Holden, A.M.I.E.E., deputy station superintendent at Deptford East generating station, has been appointed superintendent of that station. Commencing at Sheffield as an articled apprentice, Mr. Holden subsequently held situations at Clacton and Cardiff before joining the London Power Co. in 1944. In 1946 he was appointed to the position of assistant superintendent at Stalybridge, returning to Deptford in 1948.

Mr. T. E. Goldup, M.I.E.E., a director of Mullard, Ltd., has been appointed chairman of the board of governors of the Ministry of Supply School of Electronics, Malvern, in succession to Professor Willis Jackson, D.Sc., D.Phil., M.I.E.E., Professor of Electrical Engineering, City and Guilds College, London. Mr. Goldup, who has been with the Mullard organization for over twenty-nine years, and was formerly a member of the Research Staff of the Signal School, Portsmouth, has had wide experience of technical education in electronics. He has represented his company on various committees of the Radio Industry Council and he also serves on B.S.I. committees and other organizations connected with the electronics industry. Mr. Goldup has been a governor of the School of Electronics since 1949; he is in addition a governor of the Wandsworth Technical College, and a member of the advisory committee of the Norwood Technical College. He is a member of the Radio Research Board, Department of Scientific and Industrial Research.

Mr. T. E. Goldup

Mr. G. F. Freeman, M.Sc., M.I.E.E., A.M.I.Mech.E., at present head of the Electrical Engineering Department at West Ham Municipal College, has been appointed head of the Electrical Engineering Department at the Woolwich Polytechnic, as from 1st January next, in succession to **Mr. W. G. Spencer,** M.Sc.Tech., M.I.E.E., A.M.C.T., who is retiring on 15th September. Mr. Freeman was educated at East London (now Queen Mary) College, and received his electrical training with the Metropolitan-Vickers Electrical Co., Ltd., with whom he became research engineer in 1921, and design engineer, heating and cooking equipment, in 1923. Four years later he was appointed assistant lecturer in electrical engineering at the Manchester College of Technology, and in 1938 he went to West Ham Municipal College as chief lecturer in electrical engineering, becoming head of the Electrical Engineering Department in 1948.

Mr. G. F. Freeman

Mr. S. C. Howton, previously deputy superintendent at Fulham, is the new superintendent at Barking "A" and "B" generating stations. After training at Folkestone, Mr. Howton was at Maidstone, Bermondsey, Hornsey and Brimsdown before going to the Lancashire Electric Power Co. He returned to London as charge engineer at Croydon and joined Fulham in 1938.

The senior award of the Institution of Radio Engineers, the Clerk Maxwell Premium, has been made to **Mr. H. Paul Williams,** Ph.D., for his paper on "Subterranean Communication by Electric Waves," published in the Institution's *Journal* for March, 1951. Dr. Williams was formerly with A. C. Cossor, Ltd., and is now with the Fairey Aviation Co. The presentation will be made at the annual general meeting on 8th October. Other 1951 awards which will be presented at the same time are as follows:—Mr. R. E. Spencer,

B.Sc. (E.M.I. Engineering Development, Ltd.), Heinrich Hertz Premium; Mr. Emlyn Jones, B.Sc. (Mullard Research Laboratory), Louis Sterling Premium; Mr. R. G. Kitchenn, B.Sc.(Eng.), formerly of the Engineer-in-Chief's Office, G.P.O., Leslie McMichael Premium; Mr. G. E. Roberts (Decca Navigator Co., Ltd.), first award of the Brabazon Premium; Mr. E. G. Rowe, M.Sc. (Brimar Valve Division, Standard Telephones & Cables, Ltd.), Marconi Premium.

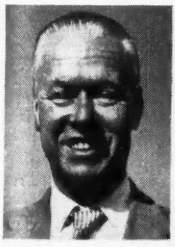
Mr. D. J. Ayers and **Mr. N. R. Munro** have joined Ashley Accessories, Ltd., as representatives for East and West London and Home Counties respectively. Mr. Ayers was with the Eastern Electricity Board and then with Dodwell & Hinton, Ltd. Mr. Munro for some years represented Johnson & Phillips, Ltd., and the English Electric Co., Ltd.

Mr. L. C. Parker has been appointed commercial engineer for the Boston district of the East Midlands Electricity Board. Since nationalization Mr. Parker has been assistant commercial engineer for the Northern Section of the District, and Mr. Fairhead, whose resignation was reported recently, occupied a similar post in the Southern Section. The large area, some 550 sq miles, previously operated by two companies, made it desirable to divide the duties until reorganization was complete. Mr. Parker was formerly with the Mid-Lincs. Electric Supply Co.

Mr. W. Whiteley, chairman and managing director of B. S. & W. Whiteley, Ltd., has recently been appointed a J.P. to the West Riding Bench.

Mr. E. J. Doyle has resigned his position as divisional manager of H. Fisher (Oldham), Ltd., to become sales manager of Controlled Heating Units (London), Ltd.

Mr. Eric A. Dymond, A.M.I.Mech.E., A.M.I.E.E., A.F.R.Ae.S. (whose portrait we reproduce with this note), has resigned from the board of directors of Sangamo Weston, Ltd.



Mr. E. A. Dymond

Among the past students upon whom the Council of the City and Guilds College has conferred the Fellowship of the Institute (F.C.G.I.), in recognition of their distinguished services and outstanding contributions to the advancement of the industry in which they are engaged, are the following:—**Mr. L. H. Bedford,** O.B.E., chief television engineer, Marconi's Wireless Telegraph Co., Ltd., and **Mr. W. A. Del Mar,** A.C.G.I., M.I.E.E., chief engineer, Habirshaw Cable and Wire Division, Phelps Dodge Copper Products Corporation, U.S.A.

Mr. C. T. M. Bagnall, who has been with Odhams Press, Ltd., has been appointed publicity manager of the English Electric Co., Ltd., in succession to Mr. Peter Scott, who recently resigned. **Mr. M. B. Schroeder,** who has been in charge of the Publicity Department at Stafford, has been appointed assistant publicity manager.

Mr. P. Sydney, commercial officer, Fens Sub-Area, Eastern Electricity Board, was recently appointed manager of the Board's Suffolk Sub-Area in succession to Mr. H. J. Wright. Mr. Sydney was educated at Tonbridge School and from 1931 to vesting date was with the Edmundson group, first as assistant district manager, Wessex Electricity Company, and then successively as personal assistant to the managing director of Edmundsons, district manager of the Wessex Company, and general manager of the Cambridge Electric Supply Co.

Mr. P. Sydney

The General Electric Co., Ltd., has appointed **Mr. Beverley Pick,** the well-known industrial design consultant, to advise on and prepare schemes where required, of decorative illumination for the Coronation.

At the annual general meeting of the British Internal Combustion Engine Research Association, held recently, the **Viscount Falmouth,** M.I.Mech.E., was re-elected president. **Mr. H. N. G. Allen** has been elected chairman of Council for the ensuing year.

Mr. A. S. Price, maintenance engineer (mechanical) at Barking "A" and "B" has been appointed superintendent at Barking "C" station. After a period at sea with the Cunard White Star line Mr. Price was appointed combustion engineer at Southampton in 1938, and in 1939 took up a position at Barking where he has been ever since.

Mr. R. H. Cotton, A.M.I.E.E., has been elected chairman of the South Western Sub-Centre of the Institution of Electrical Engineers for the 1952-53 session.

Mr. G. B. Harper has been appointed transformer engineer, Transmission Design Branch, at the headquarters of the British Electricity Authority. Mr. Harper received his early training with the Electric Construction Co., Wolverhampton, and, following war

service with the R.A.O.C. and R.E.M.E., was for some years with Bruce Peebles & Co., Ltd. He joined the B.E.A. in 1949 as assistant to Mr. R. W. Flux who resigned a short time ago to join Bruce Peebles & Co.

The accompanying picture was taken at the recent Peterborough Agricultural Show and depicts the stand of the **Eastern Electricity Board.** Col. A. E. Knights, manager of the Fens Sub-Area, is seen in the centre in conversation with Mr. G. E. C. Jones (arms folded), liaison manager, Hoover, Ltd. Mr. P. Sydney, the new Suffolk Sub-Area manager, is on the right foreground.

Mr. G. E. C. Jones (Hoover, Ltd.), Col. A. E. Knights (Fens Sub-Area) and Mr. P. Sydney (Suffolk Sub-Area) on the stand of the Eastern Electricity Board at the Peterborough Show

Mr. E. E. Faraday has resigned his position as chief theatre sales engineer with W. J. Furse & Co., Ltd., of Nottingham and has joined the Lighting Department of the Franco-British Electrical Co., Ltd. Mr. Faraday, who is well known in lighting circles as a lecturer on stage lighting, was with Holophane, Ltd., for some years before the war. During the war years he was engaged in the Electrical Research Department of the Bristol Aeroplane Co., Ltd.

A visit to **Bepco Canada, Ltd.,** is being made by a party of representatives from each of the four British constituent companies. The members of the party will be Mr. J. W. Rodger, managing director, and Mr. A. K. Aitkenhead, assistant secretary, Bruce Peebles & Co., Ltd.; Mr. D. E. Graham, general sales manager, Overseas Division, Crompton Parkinson, Ltd.; Mr. R. W. Weekes, managing director, Harland Engineering Co., Ltd.; and Mr. D. C. Lorkin, joint managing director, Lancashire Dynamo & Crypto, Ltd. The party will leave Liverpool on 16th September.

Dr. J. N. Aldington, director of the Siemens Electric Lamps & Supplies research laboratories, is attending the National Technical Conference of the American Illuminating Society in Chicago (8th-12th September). He will convey the greetings of the British Illuminating Engineering Society, of which he is a past-president, and will present a paper on "A Vision of the Future of Lamps and Lighting."

Mr. B. Plews has been appointed secretary of Trico-Folberth, Ltd. He will continue his present duties as personal assistant to Mr. Paul N. Matton, managing director.

Following the appointment of **Mr. F. N. Pardow** as manager of the Manchester Branch of the Simplex Electric Co., Ltd., in succession to Mr. W. C. Sherry, who recently retired after thirty-two years' service, the company announces the appointment of **Mr. W. Clegg** as assistant manager of the Branch.

Mr. A. M. Spooner has joined the staff of High-Definition Films, Ltd., for special work in connection with electronic process shots and artificial scenic devices. Until the end of July Mr. Spooner was a member of the Designs Department of the British Broadcasting Corporation.

OBITUARY

Capt. H. G. Merrick.—The death is reported, at the age of sixty-two, of Capt. Horace George Merrick, M.C., A.M.I.E.E., who, until electricity supply nationalization, was general manager of the Llanelly and Gorseinon electricity supply companies and of the Carmarthen Bay Power Station Co. Capt. Merrick joined Balfour, Beatty & Co. about forty years ago. He was engaged in the construction of the North Dock power station, Llanelly, and after holding a number of appointments including eight years in South America supervising the Balfour, Beatty interests there, returned to Llanelly as general manager in 1932. He won the Military Cross during the 1914-18 war while serving with the Royal Artillery.

Mr. Cyril Charles Claxton, secretary and joint managing director of the Sheffield Twist Drill & Steel Co., Ltd., who died on 8th August in Sheffield, was born at Peterborough in 1899. After joining the company at an early age he spent four years in the United States of America gaining engineering experience. On his return in 1924 he understudied his father, the late Charles William Claxton, becoming a director in 1936 and, after the latter's death in 1943, joint managing director.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Light Gauge Conduit

WITH reference to Mr. William Buckley's description of zinc conduit tube being used in Russia about 35 years ago (*Electrical Review*, 8th August), I noticed what was probably the same sort of installation being installed in houses in the town of Winterthur, Switzerland, in the years immediately following the 1914–18 war.

From my recollection, however, tube considerably less in diameter than 1in was used, at least for drops to switch positions, and so far as I remember, the tube was supplied in coils considerably longer than 10ft. At the time I was concerned with central heating and did not pay very much attention to the electrical work but I do remember being rather fascinated by the crimping tool used for bending.

If Mr. Buckley wishes to find out about this type of installation he could probably do so by inquiring of the Swiss electricity authorities.

London, W.C.2. E. M. ACKERY.

Regulation 404J

UNDER four electricity supply authorities in the last twenty years I have inspected wiring in six counties regularly. Practically all rural wiring in houses is t.r.s., twin and three-core, with three-plate roses or joint boxes. Thus Regulation 404 is most important to hundreds of wiring contractors who guarantee compliance with I.E.E. Regulations. Yet none comply.

Reg. 404J, for instance, rules out insulated switch-fuses except the M.E.M. new ones. The Regulations demand joint boxes wherever the sheath is removed, behind ceiling roses, switches, etc., but this is not done. I cannot conceive an installation using available materials and competitive in price which does not contravene this ridiculously idealistic ruling.

If the twin is taken into a box so that the sheath can be stripped, it is still necessary to come out again to enter the switch pattrass or ceiling rose pattrass. What then? Unsheathed or sheathed? Surely not unsheathed, even for so short a journey; not sheathed or there must be another box to terminate it. This is Gilbertian.

The replies to my tirades to date have been (1) Complete ignorance of 404; (2) "They are not Regulations, only words of guidance"; (3) A bald repetition of 404 from the Institution.

Can you enlighten my darkness?

Crediton, Devon. E. H. MARSHALL
(*Branch Manager*),
South Western Electricity Board.

Wiring Errors

THE potential danger involved where the phase and neutral conductors are interchanged when connected to single pole switched socket-outlets possibly constitutes one of the commonest and greatest electrical hazards. Particularly is this so with the increased use of portable equipment; the risk cannot be over-emphasized of using earthed apparatus with exposed elements, such as in most electric fires, if misconnected as above, since full mains voltage exists between the elements and frame even when switched off.

With the best will in the world human frailty is such that these wiring errors do occur. The danger is not only from cross-connections at the actual switched socket, but may happen when circuit and mains alterations take place. If this can occur with skilled operatives how much greater is the risk when unauthorized extensions are made by the ubiquitous handyman.

Double pole switched socket-outlets give complete protection from this mischance. Could not therefore something be done to ensure that only d.p. socket-outlets are installed? The I.E.E. Wiring Rules Committee might consider making this part of the Regulations in the next edition. The increased cost for the 2, 5 and 15 A sizes as given by a leading manufacturer is but a

shilling per socket-outlet; no one can regard this as an excessive price for safety. Even this extra charge would be reduced if the double pole type were made compulsory.

London, N.W.4. MICHAEL NEIDLE.

Retrogression in Transport

I HAVE read the articles published in recent issues of the *Electrical Review* on London's farewell to trams, Blackpool's trams and Edinburgh's trams with great interest, being a firm believer in electricity for cheap, speedy and efficient transport.

I entirely agree with so many writers on this subject, that the present-day trend towards the operation of transport by petrol and diesel oil buses is a grave mistake, and the fact remains that instead of making any progress, transport is going backwards.

Many cities and towns, I believe, are greatly regretting having disposed of their trams. The buses which have displaced them in so many instances are quite incapable of moving crowds of people quickly. In my opinion the bus is exceedingly uncomfortable as compared with a silent smooth running tram.

Bolton, Lancs. OWEN PRANKERD.

Devon Flood Disaster

THE South Western Electricity Board has taken all possible steps to restore supply in the Lynton and Lynmouth area where last week's floods caused terrible destruction and loss of life.

Construction engineers, linesmen and other staff were drafted into the Lynton district from various parts of the South West to bring emergency supplies of power and lighting. Electricity staffs from Barnstaple, Taunton, Bridgwater and other parts of Somerset and Devon were withdrawn from normal duties to assist in the stricken area.

Parts of Lynton and Lynmouth had been supplied with electricity from the B.E.A.'s Lynmouth generating station (one of the few in the country to operate at 100 c/s). The roof of the station collapsed in the floods, the leat conveying water to the hydro plant was washed away and the diesel plant was flooded.

Before the disaster a 33 kV line, operating at 11 kV, had been erected to provide a power supply to a part of Lynton. The old generating station provided a non-standard supply at 100/200 V, 100 c/s. Day and night efforts were therefore concentrated to change over the whole of Lynton to the new supply operating at 50 c/s, which involved the jointing of cables and changing over of appliances in people's homes. This meant the emergency acceleration of the Board's programme for standardization and reinforcement in Lynton.

The Board also offered to lend heating, cooking and other appliances to local authorities who had set up refuge centres.

Television Developments

ON Monday last representatives of the technical and lay Press went by river from London Bridge to Southend to inspect the works of E. K. Cole, Ltd. The party was accompanied on the launch *Festival* by Mr. E. K. Cole, chairman and managing director, and officials of the company, including Mr. W. M. York, who was in charge of the arrangements.

At the works the visitors' attention was drawn particularly to the equipment installed to facilitate the development of television receivers for world markets. This provides actual picture transmissions by a number of systems commonly used in different parts of the world.

Comparatively inexpensive equipment has also been developed by means of which television service can be provided in difficult fringe areas and beyond the range of existing transmitters. This equipment is installed at a suitable point near the area to be covered where it picks up the television transmission and retransmits it on different sound and vision frequencies and with a change of polarization, providing good reception over about 150 sq miles.

Among other developments shown to the party was a flying spot caption scanner for 405-, 525- and 625-line systems built to the specification of Cinema Television, Ltd.

In the Plastics Division, among other items, examples of moulded cabinets for radio sets of many makes were seen.

The Wenvoe Station

THE B.B.C. television station at Wenvoe, near Cardiff, which was opened on 15th August, is to operate initially at medium power, using the 5 kW sound and the 2 kW vision transmitters, which were manufactured by Marconi's Wireless Telegraph Co., Ltd. The vision transmitter hall was illustrated in the *Electrical Review* last week.

The switchgear for controlling the main supply of electricity to the station was manufactured by the Brush Electrical Engineering Co., Ltd., Loughborough.

Sewing Machine Motors

Large-Scale Production at a Stanmore Factory

As a result of a move last year from Kentish Town to a larger factory in Honeypot Lane, Stanmore, Sewtric, Ltd., has doubled its output of sewing machine motors and has now produced nearly half a million of these units. Production has similarly been increased of universal fractional h.p. motors supplied both as bench grinders, polishing machines, tapping machines and with flexible shafts, and also for food mixers and other appliances. About 85 per cent of the output is being absorbed by overseas markets, the motors being sent to practically every country in the world. Particularly good business is being done with the United States.

Novel Winding Machines

The up-to-date new factory has a total floor area of 15,000 sq ft, of which 2,000 sq ft is occupied by offices. The remainder, used for production, comprises a well planned machine shop, diecasting and press work section, a coil winding department equipped with novel machines of the company's own design, and sub-assembly and final assembly sections for motors, foot switches, grinder units, etc. With the exception of the laminations almost all components are made on the premises. The old factory in Spring Place, Kentish Town, is at present being retained by the company for undertaking repairs and maintenance work.

Conversion Units

The domestic sewing machine motors, which are of the universal type, are made in two sizes, $\frac{1}{15}$ h.p. and $\frac{1}{30}$ h.p., and can be supplied to convert any hand or treadle machine to electric operation. Foot controls are provided as standard equipment. The "Monoblock" or industrial model, made in $\frac{1}{5}$ and $\frac{1}{8}$ h.p. sizes, is of a new design suitable for the dressmaking, tailoring, glove, hat and fur trades. Its speed is controlled through the motor winding by pressure on the treadle connected by a chain to the motor. There is no clutch or resistance in circuit and in consequence

Right: **Assembling core laminations on the armature spindle**

Below: **Connecting up armatures of small sewing machine motors**

(1) Machining motor casings. (2) Pressing large field coils into their casings. (3) Flash testing motors. Foot control assembly is seen in the background. (4) Sub-assembly of "Monoblock" industrial sewing machine motors

electricity consumption, which is in proportion to the sewing machine output, is very low. An adjustable brake stops the machine instantly when the pressure on the treadle is released, while an adjustable brush rocker makes the motor easy to reverse. Construction is robust and operation quiet.

The bench grinders, etc., are available in $\frac{1}{15}$ h.p. and $\frac{1}{6}$ h.p. models, with variable speed control operated by turning a knob. The flexible shaft attachment will take up to $\frac{1}{8}$in, the tapping attachment being suitable for 4 B.A. downwards. Three to four weeks' delivery is quoted for most motors.

Originally the business was carried on under the name of the Display Motor Accessories Co., Ltd., which was formed in 1931, but with the concentration of production largely on sewing machine motors a new marketing company was registered in 1948 with the more appropriate name of Sew-tric, Ltd., and with Messrs. R. Caudrelier and W. Glover as directors.

Corrosion Research

NOTWITHSTANDING the great deal of research which has been going on for many years, corrosion is still responsible for much wastage, at great cost, of engineering metals. The first part of a 67-page illustrated publication entitled "Corrosion and Temporary Protectives" surveys both the purely chemical and electrochemical reactions which cause this kind of attack, while the second part contains an account of petroleum-base temporary protective coatings and their selection, application and removal, with notes on "Ensis" protectives. Copies of this technical publication, which is the fifth of a series on specialized oils and their uses, are obtainable from any of the divisional offices of Shell-Mex and B.P., Ltd.

Stringing Power Lines

Three-Sheave "Traveller" of Canadian Design

A NEW design of "traveller" has been introduced by the Hydro-Electric Power Commission of Ontario to facilitate the construction of overhead power transmission lines made up of large size conductors.

A new transmission line is being constructed between the Sir Adam Beck power station No. 2 and the Burlington transformer station, using 1,192,500 circular mil a.c.s.r. conductors to carry heavier power loads from Niagara to the east. The conductor to be used will be the largest in diameter the Commission has had to string.

The "Lacal" multiple sheave stringing traveller has been designed and manufactured by Line & Cable Accessories, Ltd., of Toronto, in co-operation with engineers of the Commission. It consists basically of three sheaves, or pulleys, of predetermined diameters.

The "Lacal" multiple sheave traveller suspended from an insulator string on British-built towers running from Hamilton, Ontario, to Niagara Falls to connect with the new Sir Adam Beck (Niagara) generating station No. 2

Mr. Robert Winning, of the Commission's line construction department, who invented the "traveller," discussing its suspension arrangement with Mr. T. Madgett, chief engineer of Line & Cable Accessories, Ltd.

In the past a single 14in diameter sheave was used to string conductors up to and including 795,000 circular mils, but it was found that the radius of that size of sheave was too small to prevent damage to the large conductor and it was impossible to pass a joint of such a conductor through the usual traveller.

On the assumption that a larger diameter sheave was necessary, it was considered too cumbersome to use a wheel of 50in diameter so a compromise was made and a three-sheave traveller was designed, utilizing the top portion of an arc having a diameter of 51in. This was achieved by using a 14in diameter centre sheave and one 8in diameter pilot sheave on each side of the large wheel to avoid any bending of the conductor joint, which is approximately 32in long and 2⅛in in diameter. The conductor weighs 1¹ lb/ft run and because of its weight the reel lengths are approximately 2,500ft, while the average span length between towers (1,000ft) necessitates a joint every 2½ spans.

The conductor is strung through travellers until the reel length has been exhausted. Another reel of conductor is then brought forward and similarly strung out until several reels have been depleted. The jointing crew then goes forward and joins the ends of the reel lengths by means of a sleeve which is pressed on to the conductor by means of a hydraulic press. The conductor is then pulled to tension, the joints passing through the multiple sheave travellers.

The three pulleys of the traveller are equipped with ball bearings for easy movement and are mounted between two side frames on steel axles. The overall length of the traveller is 34in, the overall width 11¹in and the overall height 24in. The sheaves and side frames are constructed of magnesium alloy castings. The metal used is AZ101-T44, which is primarily an aircraft alloy having high physical properties after heat treatment. The use of this very light alloy has resulted in the total weight of the unit being 65 lb.

A very simple arrangement is employed for attaching the traveller to the suspension insulators on the tower. Fastened to each side frame is a steel strap with special hinges on top; attached to the hinges is a yoke containing a ball socket which connects directly to the bottom ball of the insulator string. This feature can be modified to suit insulators of the clevis and eye type.

The suspension arrangement of the traveller can be opened by means of a special steel hinge bar on one side of the unit. This permits removal of the conductor from the traveller while the unit is still attached to the insulator string. The hinge bar is designed with a special long slot which prevents the hanging arrangement from opening accidentally while the conductor is being strung.

For ease in handling from the ground to the suspension arm on the tower, a sling eye is provided on each side of the traveller. A rope can be passed through the eye and fastened securely to reduce the danger of the unit falling while being lifted.

While the actual load on the traveller should never exceed the weight of one span of conductor (approximately 2,000 lb) the unit has been designed and tested for a load of 4,000 lb. Tests have been performed and loads up to 11,000 lb were applied to the unit without apparent failure.

Patents are pending in Canada and the United States. Information regarding the traveller is obtainable from Line & Cable Accessories, Ltd., 347, Sorauren Avenue, Toronto, 3, Ontario.

Egyptian Imports

IMPORTS of electrical machinery and apparatus into Egypt last year rose in value by about 20 per cent on 1950 and totalled £E8,236,000. Little detail regarding supplying countries is available. The returns, however, show a decline in Britain's share of the business in power plant and telegraph and telephone material, with an advance in her supplies of radio sets. The cable trade fell off but imports of refrigerators and other household apparatus expanded. The accompanying table gives the values of the chief items in 1951 with notes of increases or decreases compared with the preceding year. (Egyptian £ = 20s 6d.)

Class of Equipment	1951 £E (000)	Inc. or dec. on 1950 £E (000)
Generators motors and transformers, 1,000 kg or over	314	+ 125
From Great Britain	61	— 12
„ Switzerland	35	+ 4
Ditto, 50 to less than 100 kg	375	— 62
From Great Britain	123	— 37
„ Belgium	21	— 18
Ditto, less than 50 kg	156	— 9
Accumulators and parts	299	+ 141
From Great Britain	111	+ 34
„ United States	7	— 2
Batteries, not pocket, and parts	254	+ 107
Pocket batteries	61	+ 16
Fans	50	+ 16
Radio valves	221	+ 66
Electro-medical apparatus	149	+ 40
Electric lamps up to 40 W	93	+ 40
Ditto, 40 to 100 W	34	+ 9
Ditto, over 100 W	127	+ 107
Telegraph and telephone apparatus, ordinary and parts	878	+ 206
From Great Britain	342	— 25
Radio receiving sets	1,108	+ 361
From Great Britain	480	+ 156
„ United States	45	+ 12
„ Holland	319	+ 52
Radio transmitting sets	11	+ 8
Radio fittings and parts	143	+ 35
Other radio apparatus	17	— 27
Irons	18	+ 9
Signalling apparatus	27	+ 7
Refrigerators, domestic	527	+ 160
Other domestic apparatus	189	+ 94
Cable, insulated, submarine and underground	632	— 213
From Great Britain	261	— 160
Wire and cable, electric, unspecified and parts	364	— 102
From Great Britain	186	— 98
„ Italy	74	— 16

Street Cleansing Trucks

Wandsworth Borough Council is recommended to accept the tender of S. Hole's Electric Vehicles, Ltd., amounting to £3,295 for the supply of eight electric street cleansing trucks.

Irish Board's Silver Jubilee

Rapid and Continuing Expansion

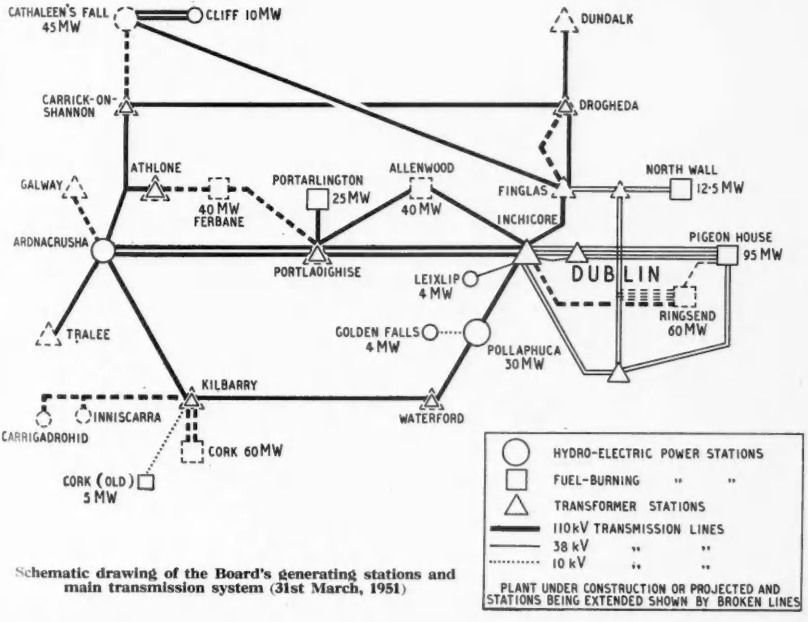
TWENTY-FIVE years ago an Electricity Supply Board was established to control, co-ordinate and improve the supply, distribution and sale of electricity in Ireland, and, in particular, to take over control and operation of the Shannon works then about half way towards completion. At the time electricity, mainly in the form of lighting, was used only in Dublin, Cork, Limerick and in some other cities and towns. To the great majority of Irish people the use of electricity was unknown.

The Shannon Scheme promised to be the first great step in providing electricity for all the towns and villages in the State and it was visualized that the supply would eventually spread out even to the farmhouses and cottages in the country.

The Electricity Supply Board, the first national authority in these islands to take over a big industry, started from scratch and began to recruit engineers and other staffs in preparation for the task which the Legislature had framed in a statute passed in the face of vigorous opposition.

Its preliminary organization completed the E.S.B. commenced the work of selling electricity to the country. It built networks to and in the principal towns and villages and then began its campaign of persuading people to install and use electricity for all purposes. Demonstrations in the various uses were organized with good results.

Three years after the Shannon Scheme started operating the E.S.B. began to pay its way and has been doing so ever since. From 1932 onwards the use of electricity increased every year and by 1935 plans



Schematic drawing of the Board's generating stations and main transmission system (31st March, 1951)

were begun for new power stations to meet the growing demand.

The development of the River Liffey, which had been proposed at the same time as the Shannon Scheme but had been postponed, was begun. Preparations were also initiated for harnessing the Rivers Erne and Lee and also for using another source of power—the large peat deposits throughout the country. The Second World War, however, delayed these projects and the full demand for electricity, which increased very considerably owing to the shortage of coal, could not be met. Electricity had to be rationed during the latter years of the war.

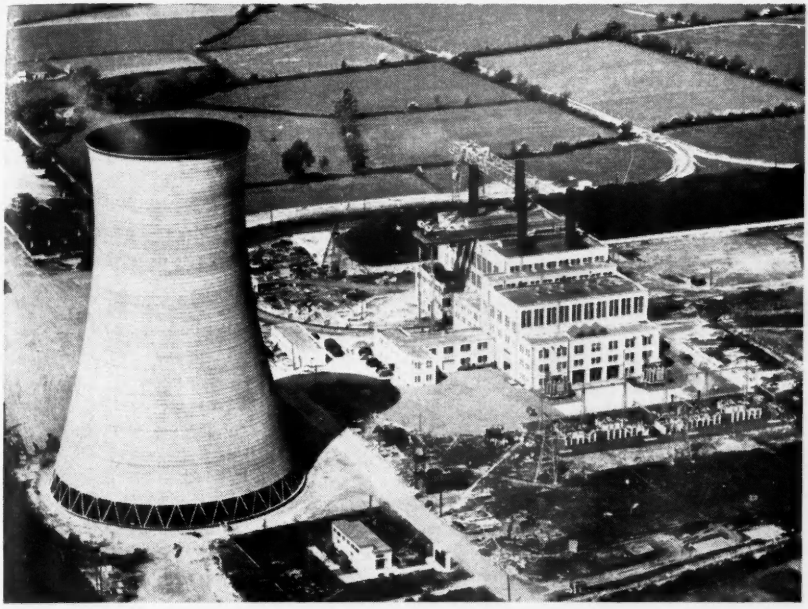
Under the chairmanship of Mr. R. F. Browne and the technical supervision of the directors Dr. T. A. McLaughlin and Mr. J. M. Fay, the Board successfully got through this difficult period. The Board's engineers, thrown back on their own resources, did a fine job in maintaining plant and they gained such valuable experience that they have since designed and constructed all new stations themselves.

Since the war the three hydro-electric stations on the Liffey have been completed, two new peat burning stations have been erected, at Portarlington, Co. Offaly (25 MW), and Allenwood, Co. Kildare (40 MW) and two hydro-electric stations on the Erne (10 MW and 45 MW) are now almost fully equipped. Supply to all the cities and larger towns and to practically all the smaller towns and villages had been completed by 1940 and two years later the Government requested the E.S.B. to plan the extension of supply to the rural areas. The rural electrification scheme was put into operation in 1947 and to-day about 25 per cent of it has been carried out. Shortage of materials has retarded its progress. Nevertheless, there are now nearly 70,000 farmers and other rural dwellers using electricity from the national networks in their homes and farm buildings.

So great has the demand for electricity grown that in the past five years generation of power has increased from 570 million kWh in 1947 to double that amount this year. It is anticipated that by 1957 the demand will require the generation of 2,000 million kWh. To cope with this increasing use of electric power the Board has planned more power stations. Two large peat fired stations are to be constructed at Ferbane, Co. Offaly, and on the Bangor-Erris bog in Mayo. These will use milled peat in contrast to the sod peat in the two existing stations. Milled peat can be more easily harvested and will burn with a higher moisture content than sod peat.

Work on the Lee hydro project, which will have two stations situated between

Aerial view of the Cathaleen Falls station on the Erne



Allenwood (Co. Kildare) peat fired power station

Cork city and Macroom, is expected to start by the end of this year. In addition two coal or oil fired power stations are under construction at Ringsend in Dublin and at Marina in Cork. Plans are also in preparation for harnessing three of the smaller rivers, the Avonmore in Co. Wicklow, the Clady in Co. Donegal and the Cummeragh in Co. Kerry.

Twenty-five years ago opponents of the Shannon Scheme said it was too big for the country, that people would never use all the electricity it could produce. To-day it is but one of the eleven power stations serving the country. In 1930 the E.S.B. had 48,000 consumers on its lines. To-day there are over 350,000 and hundreds are being added every week.

The Pigeon House (thermal) station, Dublin (95 MW), is the largest of the Board's undertakings, Arnacrusha (Shannon Scheme) is next with 80 MW of plant; the total installed capacity in the eleven stations is 350 MW of which almost exactly half is hydro-electric.

The main transmission system voltage is 110 kV (941 miles) with secondary transmission at 38 kV (1,774 miles). Distribution is at 10 kV except in the Dublin city area where the 5 kV system has been retained. There are 3,266 miles of 5 and 10 kV lines other than rural. Rural lines, 10 kV and below, have a total length of 6,789 miles. Low-voltage distribution is at 220/380 V except in the Dublin city area where it is 200/346 V and in the central part of Cork which still has d.c. at 230/460 V.

Domestic demand is responsible for 42 per cent of the total supply, motive power for industry for 34 per cent, and large-scale heating, cooking and water-heating for 13 per cent. Practically the whole of the country's street lighting is electric. In 1950–51 the average price per kWh sold was 1·74d against 1·47d in 1939–40.

At 31st March, 1951, the Board's capital assets had a value of £37·2 million. The State advances money for approved capital expenditure; interest is paid and provision is made for depreciation and sinking fund.

Turbine Shaft Distortion

Supervisory Indicators at Uskmouth

SUPERVISORY equipment for the indication of shaft distortion in steam turbines is being installed in each of the six 60 MW turbines for the new generating station of the B.E.A. at Uskmouth, Newport, Mon. Developed by the research laboratories of the General Electric Co., Ltd., for the Fraser and Chalmers Engineering Works, the equipment was connected to the first of these turbines when undergoing its steam trials at the latter works prior to despatch. The distortions of the shaft, though small, were easily observed and a much clearer idea of the relative movements of the various parts was obtained than would otherwise have been possible.

The equipment that has now been developed needs three sets of detector coils to be mounted inside the turbine: one to measure axial displacement, one to measure vertical eccentricity and displacement, and a third to measure horizontal eccentricity and displacement. The instrument readings then give a clear picture of any distortions (which are caused mainly by changes due to temperature) taking place in the turbine while it is actually running.

The equipment was specified to be independent of normal variations of voltage or frequency and to have a degree of reliability of the same order as that of the turbine set itself.

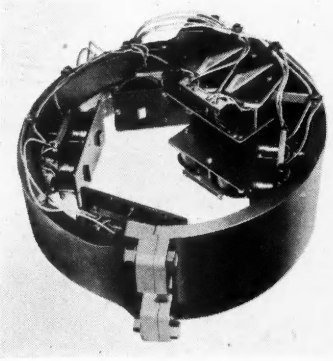
When this equipment was developed it was found possible to give, in addition to the above measurements, values of the mean position of the shaft with respect to the bearing housing, in both the vertical and horizontal directions; the position of the shaft journal with respect to the bearing and its oil film may thus be determined.

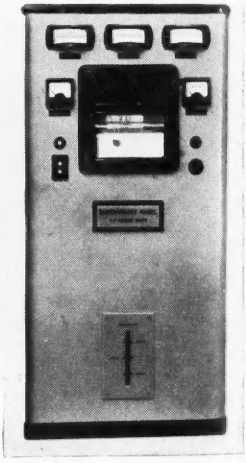
Auxiliary equipment has also been developed for occasional use during special investigations; it displays on an enlarged scale on the screen of a cathode-ray oscilloscope a polar diagram of the motion of the end of the shaft.

Measuring Turbine Speed

Additional apparatus has been developed for measuring and recording the speed of the turbine, with the aid of a small high-frequency alternator driven from the turbine shaft. As the turbine speed increases from rest, the output from the generator is fed directly to the indicating and recording instruments until about 2,750 r.p.m. is reached. At speeds above this, the output is automatically switched to tuned circuits before being fed to the instruments.

Two scales of equal length are provided on the indicator, and they are calibrated respectively from zero to 3,000 r.p.m. and from 2,700 to 3,300 r.p.m. The recording instrument has ranges covering zero to 3,000, 2,700 to 3,300and 3,200 to 3,500 r.p.m.





Above: **Detector coil assembly.**
Right: **Indicating and recording instruments built into the controls**

Engineering in Europe

Survey of Current Literature

THE most frequent causes of the unbalance in three-phase low-voltage electricity distribution systems are star-star connected transformers, but their unfavourable effect may be partially compensated for by annular "cages" or a tertiary delta-winding. For example, by the use of a compensating cage on a 115 kVA transformer the neutral-point displacement could be reduced to 1 per cent for a neutral current equal to 10 per cent of the rated current. The cross-section of the neutral conductor is also very important, although for obvious technical reasons it is mostly impossible to change it to another value on an existing system. However, an important principle is that the conductor nearest to the neutral should be the one carrying the greatest load.

Equilibrating coils are sometimes indispensable, but they introduce dangers of their own, whether they are protected by special fuses or not. Above all, if one wants to remove or reduce unbalance, one must know its amount, which cannot be established by simple and obvious means, such as three ammeters in the phase conductors, not even by four ammeters, because it will still be impossible to say from which phase the neutral current is derived.

A great improvement is afforded by the "recorder and controller for distribution systems" of the Sadir-Carpentier works which records continuously the projections of the neutral current on to the three phase voltages, and these voltages themselves. The apparatus also has two automatic commutators for load redistribution on the three phases in the case of severe unbalances.—"Control of the Unbalance in Low-Voltage Three-Phase Systems," E. Masson, *Revue Générale de l'Electricité*, Vol. 61, No. 4, pp. 165–168, April, 1952, in French.

Losses in Transformer Sheets

The accepted methods and instruments employed for measuring the iron losses in transformer sheets can be used only within a certain range of flux densities and their results must be checked by a more objective method, because it is impossible to judge the relative merits of the individual methods without reference to an "absolute" standard. The calorimetric loss determination represents such a standard method and it has been possible to measure losses at field strengths of 10,000, 15,000 and 18,000 gauss. If voltage and frequency can be kept constant and the magnetizing current is small, an accuracy of measurement better than 2 per cent is obtainable.

Comparison of the results at 10,000 and 15,000 gauss showed practically complete agreement with results obtained by the difference method with an Epstein apparatus. The calorimetric method may easily be carried out by continuously operating and recording apparatus, which would be fairly cheap.—"Calorimetric Determination of the Losses in Transformer Sheets," H. Krächter and J. Lindemann, *E.T.Z.*, Vol. 73, No. 11, pp. 362–365, 1st June, 1952, in German.

Power Line Tension and Sag

Since tension measurements by the ordinary type of spring dynamometers are rather inaccurate, and also hampered by the usually too limited scale of the instrument, recourse must be had to special instruments of which a number of constructions have been described in the literature. This article states the theory and describes some of these instruments (of Swiss, French, German and Czech design) which are tensometers with electric recording.

These methods are usually accurate within $\pm$ 5 per cent. The sag measurements may be purely optical, by use of theodolites or simple levelling instruments, but a more accurate result may be obtained by calculation from the natural oscillation frequency which may be easily determined by oscillation tests. It is, however, necessary to know the horizontal component of the tension of the conductor for determining the sag in this way. There are, furthermore, "modelling" methods for sag determination

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

(by producing a model catenary of the same ratio of parameters) and photographic methods.—" Measurement of Tensions and Sags of Overhead Line Conductors," E. Dvořáček, *Elektrotechnicky Obzor*, Vol. 41, No. 3, pp. 119–126, 1952, in Czech.

Calculating Cable Temperature

The greatest difficulty in calculating the thermal conditions for the steady state of a cable suspended in air on Newton's law is the determination of the coefficient of heat exchange (h) corresponding to the heat dissipated by a unit area of the dissipating surface (of the cable) per degree temperature difference between that surface and the ambience. This coefficient is usually assumed as a constant, without considering its dependence on conductor diameter, total temperature difference between conductor and ambience or on heat dissipated.

Only the material of the dissipating surface, e.g., copper, lead, rubber, etc., is considered in the choice of the constant. Yet by using an exact physical relation, considering heat radiation and convection, the functional relations mentioned above (usually neglected) may be introduced into the calculations without unduly complicating them and not only steady thermal conditions, but transient states are amenable to calculation.—" Improved Method of Thermal Calculation of a Cable," S. M. Bragin, *Elektrichestvo*, No. 5, pp. 5–10, 1952, in Russian.

Theory of Commutation

In experimental investigations into the commutation of d.c. machines it has hitherto been usual to consider only the processes occurring up to the breaking of the contact between brush and commutator segment. Yet the spark formation, the central problem of commutation theory, occurs only at the time of contact breaking, in an interval counted in microseconds and may be investigated only with the aid of a special set-up and suitable instruments. The first series of investigations of this kind was made by M. F. Karasev (published between 1948 and 1950 in *Elektrichestvo*).

The sudden current variation on the breaking of the contact between brush and segment sets up a considerable " switching surge " voltage which (at constant speed) depends only on the load current and is almost independent of the genertor e.m.f.; this voltage rises from a certain broken current up to about 150–170 V and then remains constant, even if the current rises further; grinding of the brushes and " compole " action only alter the curvature and the starting point of the rise of the curve of the surge voltage, but not its character nor the height of its horizontal part; sparking begins as a rule where the voltage remains steady (where the horizontal part of the curve begins).

The author attempts to give a physical and electrotechnical theory of these experimental facts and succeeds in devising a useful equivalent circuit on which to base his theory. The success is seen in the fact that calculations on this theory yield voltage curves which can be accurately adjusted to any type of surge curve actually observed. —" The Problem of the Commutation of D.C. Machines," E. M. Sinelnikov, *Elektrichestvo*, No. 3, pp. 24–29, 1952, in Russian.

Radio Interference Suppression

The sparkover on a spark plug or on a distributor segment sets up steep-fronted travelling waves that are propagated through ignition leads, ignition coil and the whole l.v. system of a motor car, i.e. the battery circuit. The latter represents the " transmitter " of interference voltages.

It can be shown that in most cases the insertion of high-ohm damping resistances into spark plug and distributor circuits is a satisfactory means of suppression, and the effect is improved by a capacitor directly in series with the ignition coil. However, full efficiency of the damping resistances can only be expected if they are inserted as close as possible to the source of interference considered, wherefore it is necessary to place part of the resistance for distributor protection in the distributor arm, and another part in the lead to the distributor segment.

Measuring results obtained on a German people's car (Volkswagen) show that complete suppression reduces the range of noise voltages emitted from about 30 m to 3 m and below (for FM), whereas it reduces the interference range for AM wireless reception from about 2,000 m to 4 m.—" Range of the Interference Suppression on Car Ignition Systems for Amplitude and Frequency Modulation Reception; Suppression by Low-Interference Sparking Plugs and Distributor Arms," K. Volk, *V.D.E. Fachberichte*, Vol. 15, pp. 182–187, 1951, in German.

Commerce and Industry

American Order for B.T.H.

London Meter Readers' Dispute

THE British Thomson-Houston Co., Ltd., has received from the U.S. Army, European Headquarters Command, an order for military electronic equipment valued at approximately $4,200,000 (£1½ million).

Zinc Restrictions Removed

The Ministry of Supply and the Board of Trade have announced that because of the improvement in supplies of zinc, restrictions on the use of the metal are to be removed. The Copper and Zinc (Prohibited Uses) Orders which prohibit the use of zinc, copper, and alloys such as brass in a large number of manufactured articles will be amended so that the control will apply in future only to copper and copper-based alloys. The amendments will come into force shortly. The administrative arrangements which restrict the use of zinc for galvanizing iron and steel sheet, wire, wire products, and tubes have been removed with effect from 15th August. Licences will still be necessary to acquire virgin zinc, but the allocation system will be discontinued.

The new Orders came into force on Wednesday last (20th August). The Orders are the Copper and Zinc Prohibited Uses (Minister of Supply) (No. 4) Order, 1952 (S.I. 1952 No. 1516), and the Copper and Zinc Prohibited Uses (Board of Trade) (Amendment No. 2) Order, 1952 (S.I. 1952 No. 1511).

Railway Rectifier Contract

Referring to the order recently received for thirty-three 2,500 kW rectifier equipments for the Eastern Section of the Southern Region, British Railways, the English Electric Co., Ltd., says that this order is part of a scheme for the replacement of the present obsolescent 25 c/s rotary convertors in the inner zone of the Southern Region, by 50 c/s rectifier equipments, together with additional plant to meet increased loading. The power will be taken from the B.E.A. Deptford power station, at 33 kV 50 c/s and the present 25 c/s generating plant will be superseded.

The rectifiers will be installed in 20 unattended substations feeding the lines in the areas Greenwich, Dartford and Northfleet, Lewisham and Chislehurst, and Catford and West Wickham. The equipment is due to go into service progressively between the spring of 1953 and the summer of 1956. Each 2,500 kW equipment consists of a 12-phase outdoor rectifier transformer and four type PVS1321 sealed steel tank rectifier units. The transformer is provided with tappings so that 2,200 kW can be supplied at the present d.c. system voltage of 660 pending a future raising of this system to 750 V.

Crompton Parkinsons' Millionth Instrument

On 14th August at the Chelmsford Works of Crompton Parkinson, Ltd., the directors of Whipp & Bourne, Ltd., were presented with a 6in dial, plastic cased circular scale moving coil instrument, the millionth instrument to be manufactured and the first of a new range. Present for the occasion were Messrs. Ian T. L. Whipp and Frank E. Whipp, together with Mr. A. V. Sowman, general manager of the Chelmsford Works, Mr. C. A. J. Martin, general sales manager, Plant Division, Mr. H. Craig, manager of the Instrument Department, Mr. W. C. C. Turner, who has been associated with the Meter and Instrument Sales Department for over 40 years, Mr. B. Jubb, sales manager for meters and instruments, and other representatives of various departments at the Chelmsford Works.

Before the presentation Mr. Sowman remarked that to achieve the production of one million instruments had required the energies and skill of at least three generations of managers, designers, foremen and workpeople. Referring to the Crompton Historic Collection, which contains what may well be the first instrument

Mr. C. A. J. Martin presents Crompton Parkinson's millionth instrument to Mr. Ian T. L. Whipp

ever produced in this country, Mr. Sowman suggested that comparison between this first instrument and the one which was being presented should reveal the enormous progress that had been made.

Norwich Service Centre

Facilities for consumers in the Norwich area have been considerably improved by the opening recently by the Eastern Electricity Board of a new electricity service centre at 21, The Walk. With an attractive double window facing the Market Square the new premises occupy a central position in the city. Revolving doors give entry to the front showroom where, mainly in illuminated recesses, are displayed a representative selection of the smaller appliances.

From the end of this showroom a few steps lead down to the main inquiry department, which is also utilized for showing various types of lighting fittings. A short passageway at the rear opens out into another larger showroom accommodating a selection of cookers, refrigerators, washing machines and other of the larger appliances. At the far end of this room are the desk for payment of accounts and also, at one side and viewed through a glass partition, a well-equipped demonstration room seating forty. A quick repair counter to which consumers may bring their appliances for "while you wait" minor repairs has also been provided.

Extensive storage space is available at the rear. Immediate communication between all departments, including the installation and repairs sections at Duke Street, is provided by means of loudspeaking telephones and telewriters.

Drivers' Handbook

The Traders' Road Transport Association, Roadway House, 146, New Bond Street, London, W.1, the national organization of "C" licence operators, has issued a pocket-sized handbook (price 1s) for drivers of commercial vehicles operated under a "C" licence. The main aim has been to make available to companies using their own road transport, a handy cheap-priced ready reference and guide written in simplified language, which can be distributed to driving employees. In the case of the smaller trader, who is also an owner-driver of a "C" vehicle, it is thought that this publication will be useful in providing him with a readily-accessible explanation of his obligations. The author of the handbook is Mr. R. E. G. Brown, A.C.I.S., A.M.Inst.T., secretary of the Association's London and Home Counties

The new Norwich service centre:

Above: **A well-equipped demonstration room has seating accommodation for forty.** *Right:* **Illuminated recesses are used for the display of many of the smaller appliances**

Area. Its contents include sections on driver's hours and driver's records, various regulations, the driver's general obligations, care of vehicles and subjects such as lighting, towing, utility vehicles, trailers, speed limits and safe loading.

New Radio Poster

An attractive new poster has been produced by Thorn Electrical Industries, Ltd., in connection with the forthcoming National Radio Show at Earls Court. This draws attention to Ferguson radio and television sets and has a bright orange background which fades out at the bottom to a dark plum colour. The word " Ferguson " is in lemon yellow against a black ground.

Diesel Plant in the Arctic

The British North Greenland Expedition, now establishing a base within the Arctic Circle at Britannia Lake, Queen Louise Land, has selected two generating sets made by Petters, Ltd., to provide lighting and power. To facilitate loading on and off aircraft under difficult conditions, they have been broken down and packed into cases two feet wide. Spares have been packed in the same way. The two generating sets were modified to a specification laid down by Captain Agar, the technical adviser to the expedition. Each set comprises one Petter AVI Mk. 1 single-cylinder, four-stroke cycle radiator-cooled diesel engine, developing 5 b.h.p. at 1,500 r.p.m., fitted with electric starter motor and a 1½ gall fuel tank. The engine is flexibly coupled to a self-exciting, self-regulating 2½ kW alternator supplying an output at 230 V 50 c/s, fitted with radio suppressors.

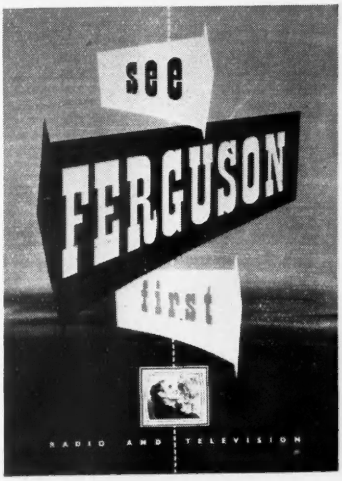
National Radio Exhibition

The 19th National Radio and Television Exhibition opens at Earls Court, London, on Tuesday next and will continue until Saturday, 6th September.

Readers are also reminded of the Radio Industries Club Ball which will be held on Friday next at Grosvenor House, Park Lane, W., from 8.30 p.m. to 2 a.m.

Power Factor Correction

Industrial electricity consumers are very anxious nowadays to obtain an understanding of power factor and the means of improving it. To assist them the Federation of British Industries, 21, Tothill Street, London, S.W.1, has produced, as No. 6 of its Fuel Economy Monographs, an illustrated 25-page booklet on " Power Factor Correction " by Mr. H. A. Jones, of British Insulated Callender's Cables, Ltd. (price 3s). This explains, in as simple terms as the subject allows, the concept of power factor and shows the effects upon power consumption of poor power factor. It goes on to detail correction apparatus and its control and then



Ferguson poster produced by Thorn Electrical Industries, Ltd.

sets out the financial benefits to those who are on kVA m.d. tariffs. Notes on the construction of capacitors are included and there is a table for the calculation of capacitor sizes for correction of existing p.f. values to higher ones.

Dealings in Lead

Following the announcement of the decision to re-open the London Metal Exchange for dealings in lead, the Ministry of Materials states that agreement has been reached with the Committee of the London Metal Exchange on 1st October as a firm date for this purpose. The Ministry will make no new contracts after 30th September for the sale of lead to consumers.

London Meter Readers' Dispute

Although at the time of going to press the strike of London Electricity Board employees at the Board's Crooms Hill, Greenwich, depot was continuing, the threatened extension of the stoppage to 20,000 other employees had not materialized.

The Board's position was that discussion upon the cause of the dispute—the discharge of meter readers said to be superfluous to the requirements—had proved fruitless, although the Board had offered to consider any constructive proposals which the men's unions put forward.

In the Board's view it was solely for the management to decide whether redundancy existed and to take the necessary steps if it did. It had endeavoured to apply its policy sympathetically by giving much longer notice than was normal and by operating the " last in, first out " principle.

Salaries Claim Deferred

At the July meeting of the National Joint Board for the Electricity Supply Industry, Mr. Harry Norton referred to the staff side's claim for a 10 per cent increase in salaries and said that the staff recognized that the best possible solution of the problem would be a fall in the cost of living. The members of the Electrical Power Engineers' Association had no desire to aggravate the spiral of rising costs and higher salaries operating at the present time, but rather to make an effort to reduce it. Accordingly he suggested that consideration of the salary increase should be deferred until September. If in the meantime it were found that other people's claims were being granted it would be impossible for the technical engineering staff to lag behind.

Mr. E. W. Bussey expressed the Electricity Board's appreciation of the "statesmanlike approach" to the problem by the E.P.E.A. and said that if other people's claims were granted the Association's members would be entirely justified in contending that they should not lag behind. They would not suffer as a result of their action.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £157 0s 0d
COPPER, H.C. Electro	ton £285 0s 0d
Fire Refined 99·70 per cent ..	ton £282 10s 0d
Fire Refined 99·50 per cent ..	ton £274 0s 0d
COPPER Tubes	lb 2s 8½d
Sheet	ton £339 0s 0d
H.C. wire and strip	ton £317 15s 0d
LEAD, English	ton £132 10s 0d
Foreign	ton £131 0s 0d
MERCURY	flask £65 0s 0d
TIN	ton £955 0s 0d
ZINC, G.O.B. Foreign	ton £122 0s 0d
Electrolytic	ton £126 0s 0d
BRASS Tubes	lb 2s 3½d
Sheet	lb 2s 6d
Wire	lb 2s 9d
PHOSPHOR BRONZE	
Wire	lb 4s 1½d
RUBBER, No. 1 R.S.S. spot ..	lb 26¼–26½d

Trade Announcements

Johnson & Phillips, Ltd., announce the appointment of the China Engineers, Ltd., 41, Chartered Bank Chambers, P.O. Box 565, Singapore, as their sole agents in Singapore and Malaya. Their new office in Singapore will be under the control of Mr. D. J. Sinclair, assisted by Mr. R. E. Negus who was trained with J. & P. at Charlton. The agency includes B.N.E. domestic appliances and Aurora lamps, as well as the full range of J. & P. plant and cable manufactures.

Mr. C. O. Innis, managing director of Electrical & Allied Distributors Co., Ltd., 31, Bruce Street, Belfast, has been appointed by **Veritys, Ltd.,** as agent for the sale of "Maxlume" fittings in Northern Ireland.

The **Electrical Remote Control Co., Ltd.,** is taking over a new factory in the Harlow New Town industrial area. On 6th September the company's address will be Elremco Works, East Industrial Area, Harlow New Town, Essex (telephone : Harlow 3032).

Parnall (Yate), Ltd., are moving their Manchester service depot to 70, High Street, Chorlton-on-Medlock, Manchester, 13 (telephone : Rusholme 3358), on 1st September. This depot provides service facilities in the North Western, Yorkshire and North Eastern Electricity Board Areas and the districts of the Merseyside and North Wales Electricity Board in the counties of Lancashire and Cheshire.

The company also announces changes in the telephone numbers of the Oxford and Stoke-on-Trent depots to Oxford 2924 and Longton 33395 respectively.

Dale Electric (Yorkshire), Ltd., has received Canadian Standards Association approval for its automatic, semi-automatic and hand controlled diesel generating plants.

From Monday next the address of the **Central Engineering Co., Ltd.,** will be Colquhoun House, 27-37, Broadwick Street, London, W.1. (telephone : Gerrard 9641-8).

Mr. Norman Sharples has been appointed by **Bill Switchgear, Ltd.,** as its representative for the north eastern area, including the territory of Lincolnshire, Nottinghamshire, Northern Derbyshire and Southern Yorkshire.

Catalogues and Lists

Aerialite, Ltd., Castle Works, Stalybridge, Cheshire.—Illustrated folder relating to the constructional features and electrical characteristics of "Ashathene" thermoplastic cable (T.L.1001).

Simpson, Baker & Co., Ltd., 24-30, Gillingham Street, London, S.W.1.—Eighty-six-page indexed catalogue of electric power tools together with priced booklet (496).

A. G. Hackney & Co., Ltd., Fairfield Pottery, Hanley, Stoke-on-Trent.—Illustrated catalogue dealing with a complete range of porcelain electrical insulators and accessories.

Strong Electric Corporation (Great Britain), Ltd., Hackbridge Mills, Hackbridge, Surrey.—1952/3 lighting season catalogue illustrating the company's range of fluorescent fittings.

British Luma Co-operative Electric Lamp Society, Ltd., Hardgate Road Glasgow, S.W.1.—Folder containing new prices lists of fluorescent lamps and tungsten lamps for general, decorative and special purposes.

CONTRACTS AND SALES

3—Performance*

By C. F. MAYSON, A.M.I.E.E.

PERFORMANCE consists in essence of the doing of work or delivery of goods on the one side and the acceptance of, and payment for, that work or goods on the other, in accordance with the terms of the contract, express or implied. Such performance effectively discharges the contract and this, of course, happens in the majority of cases. It is possible, however, for a contract to be discharged without performance (provided nothing has been done under it) merely by the agreement of the parties, which may be made orally even though the contract itself was in writing.

It sometimes happens that between the making of a contract and its completion an event occurs which renders performance impossible. For example, you have contracted to wire a house, but before you can finish the work the house is burned down. The completion of the work has been frustrated by the fire and the contract is therefore discharged. The effect would have been the same if a law had been passed which prohibited the further wiring of houses. If, however, the cause of the frustration was something which might have been contemplated before the contract became executory, so that it would have been reasonable to provide for such a contingency by inserting a suitable clause, the contract would not be discharged and damages would be recoverable for breach.

The effect of discharge by frustration is regulated by the Law Reform (Frustrated Contracts) Act, 1943, which provides in effect that if there is no clause in the contract dealing with such a situation, monetary adjustments are to be made so that as far as possible the original position between the parties is restored and loss is reduced to a minimum. In making such adjustments insurance moneys are to be ignored. In our example the wiring done in the house before the fire would be paid for on a cost basis, profit being excluded. If, however, the owner of the house had benefited at all from the work done, the Court would order him to pay such a sum as it deemed to be just in the circumstances.

Should one party unequivocally renounce the contract, the other party may either ignore it or treat it as an ordinary breach and sue for damages. If he chooses to ignore it and wait until after the completion date before taking action, the contract is still executory and it is open to the renouncing party to change his mind. Should a subsequent impossibility arise before the date of completion, such that the contract can be considered frustrated, the defaulting party can take full advantage of it even though he has not withdrawn his previous renouncement.

In the case of a lump-sum or "entire" contract, it may happen that, for one reason or another, the work is only partly carried out. As a general rule, nothing is recoverable for what has been done, but should the reason for the partial performance be the fault of the other party, the contract may be rescinded and payment claimed on the basis of *quantum meruit* ("For as much as has been done"). If, however, the work is incomplete because of lack of capital or unsuccessful efforts to get payment in advance, no claim can be made at all, unless the work that has been done has been accepted in circumstances which allowed the option of acceptance or refusal.

Where the contract has been substantially performed, or even "finished" in the ordinary sense, the agreed price less a deduction for unfinished or defective work can be recovered, irrespective of who was at fault.† The moral of this is that it is wiser to avoid lump-sum contracts unless they incorporate clauses which provide for part-payment on a measurement or other basis.

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*Previous articles in this series appeared in the *Electrical Review* of 8th and 15th August.

†*Hoenig* v. *Isaacs* (1952) 1. *The Times* Law Reports, p. 1360.

It is an old rule of law that " time is of the essence of the contract." That rule is no longer of universal application, but it still applies where expressly so made by the parties, or where the nature of the contract warrants it. Completion by a stated time is usually made a condition, so that failure to complete in that time entitles the other party to rescind. The Court of Appeal has held* that where the person ordering the work has continued to press for completion after the contract date, he has waived his right to cancel the contract. He may, however, give notice to the contractor fixing a new date at a reasonable distance ahead and if the contractor later finds himself in an unanticipated difficulty, he has no right to demand a further postponement, provided the date fixed was reasonable in all the circumstances existing when the notice was given.

Property and Possession

In a sale of goods the question of who has the property in goods at any given moment may be of importance in deciding responsibility for loss or damage. Property and possession are not the same, for possession is merely the physical control of a thing, whereas property signifies ownership. A seller may at some moment have both possession and property, but one may pass to the buyer without the other. He who has possession without property is a bailee, responsible to the owner under an implied contract of bailment which is quite separate from the contract of sale.

The passing of property in goods is governed, unless the contract provides otherwise, by the Sale of Goods Act, which states specifically that the risk passes with the property, and then enumerates rules as to when the property is deemed to pass from seller to buyer. Put shortly, goods which are in the condition contemplated by the parties pass to the buyer at the moment the contract is made, irrespective of payment; but if the seller has to do something to them (e.g., fit a flexible and plug on a fire), the property passes the moment that thing is done.

In the case of goods " on approval " or " on sale or return," any act by the buyer signifying that he intends to keep the goods, or the retention of the goods beyond a reasonable time, will cause the property to pass. Where the contract includes a delivery clause, the property passes to the buyer on handing over to an independent carrier, the buyer himself, or the buyer's agent.

Delivery and Acceptance

Delivery of goods is a matter of agreement, usually provided for in the contract. Where an independent carrier is employed, delivery to him is *prima facie* delivery to the buyer. If delivery is " free," the risk in transit remains with the seller; but where it is not, the seller must make reasonable arrangements on behalf of the buyer, bearing in mind the nature of the goods and the risk of damage in transit. Should damage or loss result, the buyer may either refuse to treat delivery to the carrier as delivery to himself, or he may claim damages.

A recent case exemplifies this.† A firm of shipbreakers sold some second-hand electrical machines and it was agreed that they should send them to the buyer by rail. The machines arrived damaged and, as they had been sent at owner's risk (apparently the usual practice), the buyers refused to accept the machines. The Court of Appeal held that a reasonable contract had not been made with the railway and the buyers were justified in their refusal.

Where incorrect delivery is made, the buyer is entitled to reject and any risk is then with the seller except in so far as the buyer is the seller's bailee whilst in actual possession. If in any delivery some of the goods correspond with the contract and some do not, the buyer may reject the whole or accept the correct portion; but he cannot accept the incorrect part on the ground that " it will do," and afterwards sue in damages for breach.

Unless otherwise agreed, a buyer is not compelled to accept delivery by instalments. Where instalment delivery is the basis of the contract, a defective delivery of, or a refusal to accept, one or more instalments may or may not amount to a sufficient breach to repudiate the whole contract. It is a question of the agreed terms and the probability of the breach being repeated.

Acceptance of goods (which must not be confused with the acceptance of the

* *Charles Rickards, Ltd.* v. *Oppenheim* (1950). *The Times* Law Reports, Vol. 66, p. 435.

† *Thomas Young & Sons, Ltd.* v. *Hobson & Partners* (1949). *The Times* Law Reports, Vol. 65, p. 365.

contract), or actual receipt of them even if not accepted, is one of the exceptions to the provision of the Sale of Goods Act that a contract for the sale of goods of value £10 or over must be in writing.* Apart from actually telling the seller that he has accepted the goods, a buyer may act in a manner which signifies acceptance. To select goods at the seller's warehouse, to examine them to see whether they conform to the contract description, or to enter into a contract for resale, would be sufficient; and, if the buyer is in possession, the retention of the goods for longer than a reasonable time without notice of rejection, is acceptance.

The price is usually fixed by the contract, but it may be left to be determined at a later date by agreement. If nothing is said as to price in a contract of sale, the Act provides that the buyer must pay a reasonable price to be fixed in accordance with the circumstances of the case.

Payment is due, unless other arrangements are made, when the property passes to the buyer. Delivery and payment are *prima facie* concurrent conditions, and it is an implied term that in return for tender of the price the goods will be handed over. Tender of goods, if refused, discharges the contract but, if the goods have been delivered and tender of the price is refused, the debt remains. A part-payment or a payment in advance, if made subsequently to the contract becoming executory, is sufficient to allow a written contract to be dispensed with.* It has been held that a cheque from a prospective buyer, retained but not cashed by the vendors while trying to induce him to vary the terms of a contract, is a part-payment.

Re-sale of Goods

When payment is due and is not made, the usual remedies for recovery of an unpaid debt are available. But if the seller is still in possession of the goods, he has a lien on them for the price and he may, if he gives due notice to the buyer, sell them again. If he does sell, however, he is technically the buyer's agent, and must pay the buyer any surplus over the contract price less reasonable expenses.

A breach of condition is a ground for rescission, although damages may be sued for instead; a breach of warranty only entitles to damages.† The measure of damages is that directly resulting from the breach, and can usually be calculated fairly accurately, for it is compensation for loss and not a penalty. Consequential damages are not usually recoverable, though they will be where it could be reasonably foreseen when the contract was made that a breach would be bound to cause the other party unusual loss.

In some circumstances it is possible to bring an action for the specific performance of a contract, and the Court may, in its entire discretion, order the contract to be performed with or without conditions. An order will be made only in very exceptional cases, and not at all if payment of damages would provide an adequate remedy. It will never be granted for payment of money or where the performance would entail constant supervision.

* See first article under "Necessity for Writing."

† See second article under "Conditions and Warranties."

Australian Electrical News

IN connection with the spending of some £30 million by the South Australian Government on a new power house at Port Augusta and the extension of the existing power house at Osborne, it is revealed that the Government intends to make itself independent of New South Wales coal by bringing about 2,700,000 tons of coal annually by rail from Leigh Creek.

The recent issue of £1,550,436 worth of £1 shares by the City Electric Light Co. of Brisbane to shareholders was undersubscribed by £650,000, and paid capital will now become about £10,200,000 instead of the proposed £10,835,054. (The company's franchise expires in February, 1954, and under the present agreement the Government has the right to purchase the undertaking from 1954 onwards.) The Queensland State Electricity Commission's loan of £500,000 at 4½ per cent, however, has been oversubscribed by £148,000, and it is expected that the Commission will seek a further loan. The Sydney County Council Electricity Authority announces a new loan of £500,000 at 4⅝ per cent interest. Its November loan of £1 million at 4½ per cent was heavily oversubscribed.

The Victorian Government Statist reports that during the six months ended 31st December, 1951, imports into that State from overseas included dynamo electrical machinery and appliances valued at £128,270 compared with £133,536 in the corresponding period of 1950. The South Australian Government Statist, however, states that in the eleven months to 31st May such imports were worth £3,170,332 (£2,338,736 in the corresponding period of 1951).

Fire Research

Investigation of Causes

THE annual report for 1951 of the Fire Research Board, which was formed in 1946, has been published for the Department of Scientific and Industrial Research and the Fire Offices Committee by H.M. Stationery Office, price 2s 1½d including postage (50 cents in America).

It is stated that the total yearly cost of outbreaks in the United Kingdom has recently been estimated at £22 million. A large proportion of the total loss is caused by a small number of very large fires. During 1950 the Fire Brigades attended 72,000 fires, of which 43,000 occurred inside buildings. Analysis of their supposed causes indicates that at least 35,000 may be considered avoidable.

Apart from the value of these statistics for investigational purposes, they reveal the prevalence of certain types of outbreak which can be controlled only by the exercise of greater care. The principal single cause of avoidable fires was heat or sparks igniting materials, furnishings and fittings; more than 9,000 fires were caused in this way. Smoking materials were responsible for starting 3,600 fires. Of the 2,800 fires caused by matches, 2,200 were attributed to children.

Use of Fire Guards

In the Board's view the most practical steps to minimize risks associated with heating appliances would be improved designs of electric, gas and coal fires, greater use of well-designed fire guards and more care in the choice of materials and the design of clothing for young children and old people.

The high rate of incidence of fires in television sets observed when the service was re-introduced after the war shows a further considerable decrease. There is evidence that changes of design introduced during the last four years have substantially reduced the hazard; even so, the fact that many incidents occur between 11 p.m. and 6 a.m. emphasizes the desirability of ensuring that sets are disconnected after use. Since 1947 the proportion of fires caused by television sets in relation to the number of sets in use has decreased by two-thirds. There are now only two outbreaks a year for every 10,000 sets in use. In contrast the rate for radio sets is roughly one fire yearly for every 40,000 sets in use.

Losses to the Electrical Industry

The average yearly number of large fires from 1944 to 1950 was 170·2 and they caused an average yearly loss of £7,289,000; 4·7 large fires yearly, resulting in an average yearly loss of £304,000, occurred in the manufacture of electrical installations, cables and apparatus. Fires inside buildings decreased to 43,744 in 1950. Tabulation according to supposed causes attributes 740 fires to electric cookers; 1,092 to electric fires, heaters and radiators; 372 to irons; 264 to motors; 1,132 to refrigerators; 2,250 to wires and cables; 450 to radio and television sets; 906 to other apparatus; 64 to lightning; and 22 to static electricity.

Outdoor fires totalled 28,130. Similar classification shows that 26 were attributable to electric motors; 2,462 to wires and cables; 374 to other apparatus; 30 to lightning; and only two to static electricity.

Comparative figures for previous years are tabulated in the report which, as usual, outlines the investigation work which the organization is carrying out concerning the initiation, growth and suppression of fires, the behaviour of various materials in fires, measurement of radiation from fires and the simulation of transmission of heat through materials by electrical networks.

In this connection the second analogue machine, which was referred to briefly in last year's report, has proved to be an invaluable tool for analytical studies of wood and other materials when submitted to radiant heating. The machine enables predictions to be made of the temperatures at any points in a material whose surface is subjected to heat radiation either of a constant or an impulsive intensity.

It has been found that over a wide range of incident intensities above the critical value the moment of ignition coincides with the time at which, according to predictions of the analogue, the surface temperature of cellulosic material will have reached 500 deg C. Although the critical intensity for spontaneous ignition does not vary with the thickness of the material, the thickness does influence the time taken by the surface to reach the spontaneous ignition temperature.

Another interesting estimation which is obtainable from the analogue is that when wood is exposed to any intensity of radiation for 30 seconds the temperature at depths greater than 5mm does not rise appreciably during that period compared with that of the surface.

The use of optical systems for calculating heat radiation and the employment of models for studying growth of fire are mentioned in the report. Among special hazards, a study is being made of explosive dusts in factories and mines and a small section has been established at the Safety in Mines Research Establishment at Buxton for this purpose.

Engineering Wages Decision

Further Discussions with Employers

AT the annual conference of the Confederation of Shipbuilding and Engineering Unions at Southsea last week a resolution proposed by the Executive Council giving it authority to seek immediate conferences with the employers' organizations in connection with the engineering unions' claim for a £2 a week wage increase was passed unanimously. The resolution called upon the Council to draw the employers' attention to the serious situation which existed as a result of their rejection of the unions' claim. The Amalgamated Engineering Union had previously urged that a ballot should be taken to decide whether to enforce the claim by strike action or by a ban upon piecework and overtime.

Mr. H. G. Brotherton, president of the Confederation, in moving the resolution, said that he could not believe that the employers would allow the talks to become abortive once they understood the dangerous nature of the existing position. Nothing in the resolution affected decisions already taken by member-unions. Whatever the employers said, the Executive Council would return to the unions for a decision on future action. Approval of the resolution would show the unions' determination to try to continue in reasonable order instead of in industrial chaos.

The attitude of Mr. R. G. McLennan (Electrical Trades Union), who seconded, was that the resolution did not represent a renunciation by the trade unions. It gave a month's grace but if the employers persisted in rejecting the claim the Confederation must lead the workers into strike action.

In the course of the debate some speakers suggested that the demand for a £2 increase should not be rigidly adhered to. The Executive Council is to report the results of the discussions with the employers to a meeting of union executives on 10th September.

The conference passed another motion from the Amalgamated Engineering Union proposing that immediate notice should be given to terminate the national agreement of 1922 dealing with procedure for the avoidance of disputes in the engineering industry. It was agreed, however, that action should be deferred until the Executive Council had had a reply (expected on 22nd August) from the employers to proposals put forward in April last.

It was later announced at the conference that the engineering employers had agreed to meet representatives of the unions to-day (Friday).

A resolution was passed on Thursday last week to the effect that it was the trade unions' duty to secure increases in their members' real wages. Engineering employers would be asked to consolidate existing basic rates and bonuses into standard time rates and pay a minimum of a third more than these rates for piecework.

The A.E.U.'s policy was expressed in another motion put by Mr. R. Openshaw. It included demands for payment of double time for night-work and treble time for Sunday work and stipulated that there should be a thirty hours per month limit on overtime.

Silicone Rubber

THE plant now being constructed in Britain by Albright & Wilson, Ltd., for the manufacture of silicones is expected to come progressively into full production during 1953. Certain grades of silicone rubber are now being manufactured here and sold under the trade name "Silastomer" by Midland Silicones, Ltd., 49, Park Lane, London, W.1.

ELECTRICITY SUPPLY

Output Rises in July

Waikato River Scheme

AFTER falling during the preceding three months, the quantity of electricity generated by the British Electricity Authority, the North of Scotland Hydro-Electric Board and the Lochaber Power Co., increased by 2·2 per unit as compared with July, 1951, the total for the first seven months (35,435 million kWh) showing a rise of 1·7 per cent as compared with the corresponding period of the previous year.

ELECTRICITY GENERATED AND PLANT CAPACITY

	Fuel consumed Thousand tons		kWh generated Millions			kWh sent out Millions	Installed capacity (m.c.r.) MW
	Coal	Oil	Steam	Water power	Total*		
British Electricity Authority ..	2,281	3·4	4,014	15	4,037	3,784	16,100
North of Scotland	13	1·0	20	85	108	107	644
Total for July, 1952	2,294	4·4	4,034	100	4,145	3,891	16,744
Corresponding total for July, 1951	2,334	4·6	3,974	74	4,057	3,812	15,364
Increase or decrease, per cent ..	−1·7	−4·3	+1·5	+35·1	+2·2	+2·1	+9·0
Total for year to date (7 months) ..	19,608	39·8	34,362	983	35,435	33,397	
Total for corresponding months of 1951	19,973	54·9	33,944	795	34,848	32,893	
Increase or decrease, per cent ..	−1·8	−27·5	+1·2	+23·6	+1·7	+1·5	

* The total includes 6·3 million kWh generated by oil engines and 4·4 million kWh by waste heat plant in July, 1952.

At the end of the last month the installed capacity of the power stations of the B.E.A. and the North of Scotland area aggregated 16,744 MW. In July the following new plant was installed by the B.E.A.:—60 MW set at North Tees; 320,000 lb/hr boiler at Plymouth.

Re-wiring Bedford School

At a meeting of the Harpur Trust Governors, Bedford, recently the Estate Committee reported that it was necessary to renew the electrical installation at the Bedford Modern School. The Eastern Electricity Board had quoted a figure of £3,000 for the re-wiring of the school (excluding fittings) and the provision of a fire alarm system and clocks. On the Committee's recommendation the governors approved the first instalment of the scheme estimated to cost £950.

New Zealand Power Scheme

New Zealand authorities say that serious faults have been discovered in some of the equipment obtained from overseas to complete the hydro-electric project at Maraetai, on the Waikato River. Everything is being done to have the station operating at half-head by October. The date set for full operation of the project—next February—should not be affected.

On 29th September, Holland & Hannen and Cubitts, contractors for the Roxburgh hydro-electric project, will formally take over control of the works. The first staff party is expected to arrive by air at the end of August. From then on a steady inflow of overseas workers will go to Roxburgh.

Street Lighting

SHIPLEY U.D.C. is to accept a quotation of the Yorkshire Electricity Board for the installation of street lighting on a further section of the Owlet Hall estate at a cost of £1,169.

The main road to NEWCASTLE-ON-TYNE airport is now illuminated by Osram 140 W sodium lamps in G.E.C. Z9425 lanterns at an average spacing of 120ft on both roads of the dual carriageway. Roundabouts are lit by similar lamps in G.E.C. Z9443 lanterns.

GOSFORTH (Northumberland) U.D.C. has received sanction to borrow £5,840 for installing improved street lighting in Station Road, Church Avenue, Kenton Road, Salters Road, Haddricksmill Road and Jubilee Road. It is also proposed to install electric lighting in St. Nicholas Avenue, Rectory Grove and Belle Vue Avenue.

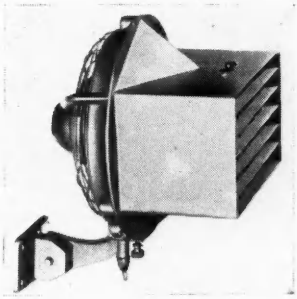
The CROOK (Co. Durham) U.D.C. is to spend £1,970 on the installation of forty-seven electric lighting units with remote control on the Low Willington Estate.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Unit Convection Heater

THE "Kaloric" 3 kW electric unit heater, supplementing the company's range of convector heaters from 750 W to 3 kW and unit heaters from 4 to 20 kW, has been developed by M. & J. Lossos & Co., LTD., 31, Beethoven Street, London, W.10, to provide an effective wall-mounted fan heater for industrial and commercial users which can be operated from any 15 A plug. The air flow can be directed where required by operating special adjustments, allowing the heater to be swivelled in the horizontal plane by approximately 120 deg and by approximately 30 deg in the vertical plane.



"Kaloric" unit convection heater

The heater is provided with a thermal cut-out, and the wiring is arranged in such a way that the fan can be kept in operation independently of the heater for ventilation purposes in summer. The heater casing is of attractively finished sheet steel and incorporates patented elements which operate on black heat. It is wired for single-phase a.c. supply only. The weight is 15 lb and the dimensions 15½in high, 12in wide and 14in deep.

The heater is marketed at £13 10s (free of purchase tax).

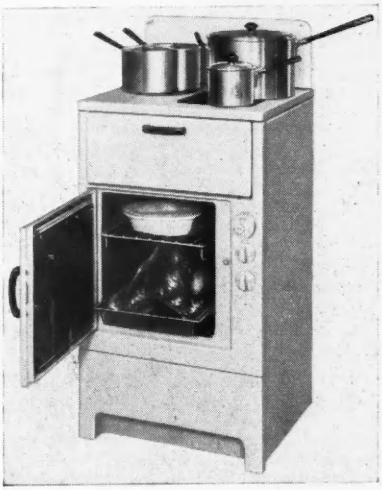
New G.E.C. Cooker

Despite its low price a new cooker brought out by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, meets the requirements of a family of five, is pleasing in appearance and has an easy-to-clean, acid-resisting porcelain enamel finish. It harmonizes with the modern kitchen and will meet the needs of housing estates and the hire-purchase schemes of electricity boards.

The oven, which is large enough to hold a 21 lb turkey, is fitted with panel elements designed to give efficient heat distribution and economy in consumption of electricity, an "Ovenmaster" automatic temperature control being provided. There is a side opening door and the oven interior is easily removable in three pieces for cleaning.

The hob equipment comprises one 8in boiling plate and a grill-boiler measuring 10½in by 8 in, both fitted with three-heat control switches and constructed according to the E.D.A. interchangeability specification. Simmer control can be provided for the 8in plate as an extra.

Supplied in a light mottled grey colour, the cooker is available either on legs (DC452) for £24 10s or on a plinth (DC453) for £25 10s. The latter is also available in green and cream at a slight extra charge. Every cooker is furnished with a grill pan, grill grid, deflector plate, oven pan, splashguard, cookery book and instruction card. Overall dimensions of the cooker (including

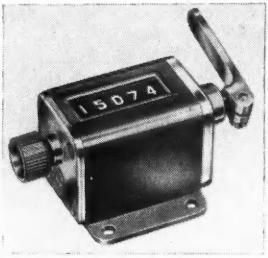


New G.E.C. cooker mounted on a plinth

splashguard) are 21in wide, 17in deep, and 43¾in high. The net oven cooking space is 12⅜in wide by 14¼in deep by 13¼in high, while the warming cupboard space is 17⅞in wide by 12½in deep by 6in high. The total loading is 6,050 W.

Small Resetting Counter

ENGLISH NUMBERING MACHINES, LTD., 25, Queensway, Enfield, Middlesex, have introduced an improved model of their small resetting counter. This Series 426 four- or five-



E.N.M. small resetting counter

figure machine is a complete redesign for ratchet or universal drive; the former provides a count for each shaft oscillation of 45 deg to 50 deg, the latter a count for each complete revolution of the driving shaft; conversely, it can be employed as a ratchet operated unit counting one for each oscillation through an angle of 130 deg to 180 deg. The ratchet design is conservatively rated at 1,000 counts per minute and for the universal 1,000 r.p.m. All working parts are of hardened steel and have a cadmium flashing. The static parts are of stainless steel. The figure design is readable up to a distance of 9 or 10ft.

The drive of the counters can be on the left or right side with either direction of rotation (in the ratchet form) and left or right hand for the universal drive. Resetting is by one turn of the knurled knob. A lock and key reset is being made available and a detachable key of the Yale type will be utilized.

Bar End-forming Machine

A bar end-forming machine announced by MANCHESTER REPETITION ENGINEERS, LTD., Reynold Works, Chell Street, Longsight, Manchester, 12, has been specially designed for facing, or for producing points, chamfers, tapers, radii and cones on both ends of a workpiece simultaneously; it is well suited to pointing one end and facing and centring the other end of butt-welded drill blanks. Two tools are carried by each cutting head, which are enclosed in housings which, in turn, carry bushes for centralizing the workpiece. The bushes are interchangeable for various diameters while the workpiece is gripped in position by two air-operated vices having serrated jaws, which can be moved along the bed and are held by two locking bolts. The jaws are opened and closed by a foot-pedal air valve.

The driving motor is of 2½ h.p. and the speed range is 275 to 1,650 r.p.m., the speed varying unit being grouted to the floor at the back of the machine. A vee belt drives the lay shaft, which is geared to the cutting heads, both of which are supplied with cooling solution by a ¼ h.p. "Mini-Suds" pump. The machine takes workpieces from ½ to 1¼in in diameter and 4 to 13in long.

Portable Plier Welder

To meet the need for a spot welding machine capable of being taken to the work MERITUS (BARNET), LTD., Wood Street, Barnet, Herts, have produced a portable plier welder. This comprises a transformer mounted on wheels from which leads run to a pair of electrode holders arranged to close by the pressure on a hand lever. The operation simultaneously closes a small switch which initiates the welding cycle. Current is cut off upon the release of the lever. An electronic weld timer can be provided.

To enable the welder to be used as a fixed plant a steel pedestal is available. In this case water cooling attachments can be supplied.

The nominal output of the transformer is 10 kVA (400 V single-phase input). The electrode pressure is 160 lb ; the plier throat is 12in wide; the maximum welding rate is 300 spots an hour; and the machine maximum capacity is 2 × 16 s.w.g. mild steel sheet or single 18 s.w.g. sheet to $\frac{3}{16}$in angle.

"Meritus" portable plier welder

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

The Revo Electric Co., Ltd.—The annual meeting was held on 13th August, Mr. W. L. Barrows (chairman) presiding. In his circulated statement, the chairman said that modernization of the production plant and layout had resulted in a steady improvement in production. A long-term plan was in being to further this modernization, but owing to changed conditions this might take longer to complete than was originally anticipated. The modernized concrete lighting standards department was now in full production. In the field of public lighting they had had considerable success during the year, the floodlighting of outdoor sports in particular having received special attention. Satisfactory orders were received for domestic appliances during the year under review, but since the end of the year there were indications of substantial reductions in demand for many of these lines. The outlook in regard to exports was becoming more obscure. Fortunately the interests of the company were widely spread, and the manufacturing facilities could be readily adapted for alternative products. Such an adaptation and change-over was at present well under way.

Associated Insulation Products, Ltd.—A record volume of business by companies of the group was reported at the annual general meeting by Mr. L. W. Farrow, the chairman. For some months the directors have been considering plans for the formation in Canada of a company to operate eventually on the same lines as the Micanite & Insulators Co., Ltd., in this country and the Mica Insulator Company in the U.S.A.

Thorn Electrical Industries, Ltd., reports a consolidated trading profit for the year ended 31st March last of £681,169, as compared with £517,323 for the preceding year, and after providing £288,185 for taxation, a net profit of £210,885 (against £165,218). General reserve receives £120,000, and it is proposed to pay an ordinary dividend for the year of 12½ per cent (against 10 per cent). The balance carried forward is £65,974 (against £52,109 brought in).

Newton Brothers (Derby), Ltd., report a trading profit for the year ended 31st March last of £155,070, as compared with £167,094 for the preceding year, and after meeting all charges, including £77,831 for taxation, there is a net profit of £43,690 (against £60,935). General reserve receives £15,000 and it is proposed to pay a dividend for the year of 15 per cent, plus a bonus of 1¼ per cent. This compares with 13¾ per cent for 1950-51. The balance carried forward is £30,150 (against £30,938 brought in).

The Radio & Television Trust, Ltd., reports a consolidated profit, before taxation, for the year ended 31st March last of £48,465, as compared with a loss of £49,787 for 1950-51. Taxation absorbs £12,920. There is a non-recurring credit of £653 (£50,859). The adverse balance on consolidated profit and loss account is reduced to £790,210. Losses carried forward in the holding company's accounts amount to £806,108, but profits of £15,898 are carried forward in the accounts of the subsidiaries.

The London Electric & General Trust, Ltd., reports a revenue for the year to 30th June last, after charging £29,677 for income tax, of £34,845, as compared with £32,354 for 1950-51. The final dividend proposed is 5½ per cent (against 4½ per cent), making 8 per cent for the year (6½ per cent).

The Engineering & Lighting Equipment Co., Ltd., reports a trading profit for the year to 31st March last of £102,066, as compared with £89,847 for 1950-51, and after providing £51,500 for taxation, there is a net profit of £33,616 (against £31,702). It is proposed to pay an ordinary dividend for the year of 10 per cent (against 5 per cent), and to carry forward £44,744 (against £24,852 brought in).

The English Electric Co., Ltd., is paying an interim ordinary dividend of 5 per cent. This is at the same rate as in the previous year but is paid on larger capital.

Cable & Wireless (Holding), Ltd., is paying an interim dividend of 3 per cent, less tax. This is the first occasion on which an interim dividend has been paid. For 1951 the distribution was 8 per cent, which included a bonus of 2 per cent.

The West London & Provincial Electric & General Trust, Ltd., is paying an unchanged interim dividend of 3 per cent.

Christy Bros., Ltd., record a group profit for the year ended 31st March amounting to £23,802, compared with £32,176 in the previous twelve months. This figure was reached after

providing £34,142 (£40,339) for taxation. A sum of £1,000 transferred last year to deferred dividend reserve is being used to help pay a dividend of 7 per cent on the ordinary capital increased by £50,000 to £200,000 by an issue of shares for cash (against 6 per cent on the old capital and 1½ per cent on the new for the previous year). £27,068 (£23,429) is carried forward.

New Companies

Redcliffe Industries (Bristol), Ltd.—Registered 14th July. Capital £5,000. Manufacturers of, dealers in and agents for, repairers and hirers of electronic, radar, atomic, electrical and mechanical apparatus and accessories, etc. E. W. Hutton and R. G. Hawkins are the first directors. Regd. office : 1, William Street, Totterdown, Bristol, 3.

Best & May, Ltd.—Registered 17th July. Capital £100. Manufacturers and dealers in electrical and engineering products of all kinds, wireless and television sets, etc. Directors : J. T. May and W. Best. Secretary : L. V. Smith. Regd. office : 345, Kennington Road, S.E.11.

Crosfield Instruments, Ltd.—Registered 17th July. Capital £1,000. Manufacturers, importers and dealers in electrical and mechanical machinery and apparatus, etc. Directors : J. F. Crosfield, director of J. F. Crosfield, Ltd., and D. H. Bent. Regd. office : 8, Drapers Gardens, E.C.2.

Wilton Engineering Co., Ltd.—Registered 25th July. Capital £100. Electrical contractors, electrical, mechanical, motor and general engineers, etc. Directors : G. D. Hurst, Laura M. H. Hurst, E. Mellersh-Jackson and Gillian P. Mellersh-Jackson. Secretary : E. Mellersh-Jackson. Regd. office : Bell Lane, Wilton, Wilts.

Kent Insulations (Manufacturers), Ltd.—Registered 24th July. Capital £100. Manufacturers, processors and specialists of insulating and non-conducting materials of all kinds, cables, covered wires, etc. Directors : Mrs. Jessie L. Earnshaw, Mrs. E. M. Grindley and Mrs. Olive W. Swan. Secretary : A. C. Earnshaw. Regd. office : Aldine House, 10/13, Bedford Street, W.C.2.

W. Lawrence (St. Albans), Ltd.—Registered 25th July. Capital £500. Electrical engineering contractors, electricians, radio engineers, etc. Directors : W. H. Lawrence and E. E. Lawrence. Secretary : Constance M. Lawrence. Regd. office : High Street, Wheathampstead, Herts.

Langham Thompson Productions, Ltd.—Registered 30th July. Capital £1,000. Electrical, electronic, radio and mechanical engineers, etc. Directors : J. L. Thompson and E. Gartside. Solicitors : Braund & Hill, 6, Grays Inn Square, W.C.1.

Leslie J. Banbury, Ltd.—Registered 29th July. Capital £10,000. Dealers in radio, television and electrical equipment, etc. Directors : L. J. Banbury (permanent) and Mrs. S. Banbury. Secretary : R. Banbury. Regd. office : 17c, Park Street, Swansea.

Brimac (Products), Ltd.—Registered 1st August. Capital £5,000. Manufacturers and dealers in artificial lighting apparatus, electrical plant, machinery, fittings and accessories, etc. Directors : W. B. Mackie and K. I. Goodman (directors of Brimac (Electric), Ltd.) and A. C. Baker. Secretary : Dorothy M. Gillespie. Regd. office : 37, West Street, Horsham, Sussex.

H. C. Hopkins & Co., Ltd.—Registered 1st August. Capital £2,000. Wholesale dealers in electrical goods, etc. Permanent directors : H. C. Hopkins and J. W. Symington. Secretary : J. W. Symington. Regd. office : 25, Charles Street, Leicester.

Liquidation

Onchan Electrical & Radio Service, Ltd.—Winding up voluntarily. Liquidator, Mr. J. W. Manderson, St. George's Chambers, Athol Street, Douglas, I. of M.

Bankruptcies

K. G. Rudd, 4, Commercial Road, Louth, Lincs, radio and electrical contractor, formerly carrying on business at 52, Eastgate, Louth.—First meeting held 20th August. Public examination 2nd October at the Town Hall, Great Grimsby.

C. L. Philpott, 55, High Street, Walton-on-Naze, Essex, radio and electrical dealer.—Last day for receiving proofs for dividend 29th August. Trustee, Mr. A. W. Hunter, Walter House, 418-422, Strand, London, W.C.2.

R. H. Tuck, 7, Grand Parade, Upper Richmond Road, London, S.W.14, electrical engineer, and lately carrying on business with another as London Electrical Contractors at 109, Great Russell Street, London, W.C.1, and at 9, Newman Street, W.1, and also lately carrying on business with another as Brotherton & Tuck, at 9, Newman Street, W.1.—Last day for receiving proofs for dividend 29th August. Trustee, Mr. W. F. Cresswell, Bankruptcy Buildings, Carey Street, London, W.C.2, Senior Official Receiver.

R. G. Eves, 138, Hennicker Gardens, East Ham, London, E.6, formerly of 30, Grange Crescent, Gosport, Hants, electrical engineer, lately carrying on business at the Abbey Restaurant, 28, East Street, Titchfield, Hants.—Last day for receiving proofs for dividend 2nd September. Trustee, Mr. W. H. Meredith, 16, Westwood Road, Southampton, Official Receiver.

STOCKS and SHARES

STOCK Exchange markets are maintaining a steady tone, with prices showing a majority of improvements week by week. The market for British Government and gilt-edged securities continues very firm. New issues in that department are readily subscribed, and confidence has returned in a manner which causes a certain amount of mild surprise. It has the effect of spreading a generally cheerful tone through most of the markets, and of attracting fresh money, not only to trustee securities, but also to a large number of shares in industrial companies. Chairmen at the various company meetings mostly take a cautious view of the outlook. Meanwhile, the weekly changes in Stock Exchange prices are, as already mentioned, mainly in the upward direction.

Movements in Prices

Reference to our overleaf prices show that Babcock & Wilcox lead the improvements since a week ago, with a rise of 6s 3d to 70s. Following this Chloride Electric, 58s 9d, Ericsson, 38s 9d, London Electric, 48s 9d, and Johnson & Phillips, 52s, are a florin to half-a-crown higher. A number of other gains range from 6d to 1s 6d. In company with the improvement in ordinary shares, there is also noticeable a steady advance in good class preferences.

Crompton Parkinson

Prices of shares in the companies connected with the heavy electrical machinery industry and its group continue very hard; in several instances further gains have taken place on the top of those recorded here last week. One of the shares which appears to be rather hanging back is Crompton Parkinson ordinary. The 5s shares stand at 8s 9d, and can be bought at about that price. At 8s 6d, as our lists overleaf show, the yield on the money is £6 12s 3d per cent on the present-paid dividend of 11¼ per cent. This looks a good return in view of the solid character of the investment.

Metal Industries

The annual meeting of Metal Industries, Ltd., is to be held on 1st September in Glasgow. The preliminary results came out at the end of June, and the complete accounts of the consolidated company show a net balance of £612,528. The ordinary dividend, as already stated, is to be 15 per cent for the year, which takes £245,000 as against £156,000 this time last year. The directors decided last month to capitalize £780,000 of the reserves and a share-for-share bonus was distributed. At the same time, the authorized capital was raised by £2½ million, to £10 million. The company is doing extremely well, and the price of the shares is 1s up on the week at 38s 9d, showing, at that price, a return of practically 7¾ per cent on the money.

Expansion and Capital

As is well known, Metal Industries holds a large and valuable interest in British Oxygen ordinary shares, and, on the recently published figures, it might almost appear as though before very long further capital will be required by both companies in order to cope with the expansion in their business. Last month, Metal Industries made a bonus scrip issue of shares, and, allowing for this, the earnings come to 27 per cent. It does not appear to be unduly optimistic to expect that the present-paid dividend of 15 per cent will be maintained, or will, at any rate, suffer no more than a slight reduction.

Deferred Payment

Thorn Electrical Industries would probably have raised its dividend last year, but limitation was the operative word at that time, and the increase turns out to have been merely postponed. The company is paying 12½ per cent, an advance of 2½ per cent, and the trading figures are excellent. No change occurred in the price, which remains at 8s 6d, showing a yield, on the 12½ per cent basis, of nearly 7½ per cent on the money.

Telephones and Cables

The shares in companies engaged in work connected with telephones, telegraphs and cables are decidedly popular in consequence of the prevailing impression that all such undertakings will be provided with ample employment for several years to come. The majority of these companies occupy positions of such financial strength as justify investment in the shares at prices which, by comparison with other industrials, look fairly high. This means, of course, that the yield obtainable from investment in such issues is, also by comparison, noticeably modest, as may be seen by reference to the tables overleaf. It may be of service to set out a few examples in the telephone and cables group which are not included in our usual quotations. For instance:—

Ordinary	Price	Last Div.	Earned	Yield
Enfield Rolling Mills	38/–	12½	141·8	£6 11 7
Globe Tel. & Trust	24/6	8	10·0	6 10 7
Phoenix Tel. & Elec.	5/3	10	10·6	9 10 0
Reliance-Clifton ..	21/3	30	122·9	7 1 2
Tel. & Gen. Trust	26/3	8	25·6	6 2 9

The Phoenix and the Reliance-Clifton shares are of 5s each; the others are £1 shares.

Electrical Investments

Past Week's Price Changes

Company	Dividend Previous	Dividend Last	Middle Price 18th Aug. 1952	Week's Rise or Fall	Est. Yield p.c. £	s	d
Gilt-edged and Overseas Stocks							
Brit. Elec. 1968/73	3	3	83½	+½	3	11	10
Brit. Elec. 1974/77	3	3	81xd	—	3	14	1
Brit. Elec. 1976/79	3½	3½	87½	—	4	0	0
Brit. Elec. 1974/79	—	4¼	99	—	4	5	10
Calcutta Elec. ..	6†	6†	20/6	—	5	17	1†
East African Power	7	7	26/6	+1/-	5	5	8
Nigerian Elec. ..	10	10	21/3	—	9	8	2
Palestine Elec. "A"	5†	5†	13/6	—	7	8	2†
Perak Hydro-Elec.	Nil	Nil	12/6	—		Nil	
Equipment and Manufacturing							
Aberdare Cables (5/-)	20	20	13/9	—	7	5	6
Aerialite (1/-) ..	83½	88½	7/6	—	11	14	6
Aron Elec. Ord. ..	15	15	33/9	—	8	17	9
Assoc. Elec. Ord...	20	20	69/6	—	5	15	2
Automatic Tel. & El.	15	15	57/6	—	5	4	2
Babcock & Wilcox	18	18	70/-	+6/3	5	2	10
Baldwin, H. J. (2/-)	25	25	4/9	—	10	10	6
Bakelite (10/-) ..	—	—	17/-	—		—	
British Aluminium	10	12	41/6	—	5	15	9
B.I. Callender's ..	7½	9	30/3	—	5	19	0
British Thermostat (5/-)	30	30	24/6	—	6	2	5
British Vac. Cleaner (5/-)	25	25	13/-	—	9	12	4
Brook Motors (10/-)	20	20	28/9	—	6	19	2
Brush Ord. (5/-) ..	10	10	5/9	+3d	8	13	10
A. F. Bulgin (1/-)..	27½	30	2/6	—	12	0	0
Burco (5/-) ..	42½	38½	19/6	—	9	18	6
Chloride El. Storage	15	15	58/9	+½	5	2	0
Cole, E. K. (5/-) ..	25	25*	15/6	—	8	1	4
Cossor, A. C. (5/-)	Nil	Nil	12/-	+1/-		Nil	
Crabtree (10/-) ..	17½	17½	32/6	—	5	7	8
Crompton Parkinson Ord. (5/-) ..	11½	11½	8/6	—	6	12	3
De La Rue (5/-) ..	50	35*	11/6	−6d	10	17	4
Decca (1/-) ..	112½	112½	15/9	—	7	2	9
Dewhurst (2/-) ..	35	20½*	4/3	—		—	
Dictograph Tel. (2/-)	20	20	4/6	—	8	17	9
E.M.I. (10/-) ..	8	12	15/3	+6d	7	17	4
Electrical Components (5/-) ..	20	20	10/-	—	10	0	0
Elec. Construction	15	15	47/6	—	6	5	3
Enfield Cable Ord.	7½	7½	21/-	—	7	2	10
English Electric ..	15	15	56/-	+1/-	5	7	2
Ericsson Tel. (5/-)	22†	22*†	38/9	+½	2	16	8†
Ever Ready (5/-)..	35	35	24/6	—	7	3	0
Falk Stadelmann	15	15	36/-	+3d	8	6	8
G.E.C. Ord. ..	17½	22½	83/6	−1/-	5	7	10
General Cables (5/-)	30	30	12/6	—	12	0	0
Greenwood & Batley	15	15	37/-	—	8	2	2
Hackbridge Cable (5/-)	20	20	10/9	—	9	6	0
Hackbridge Hewittic (5/-)	18	20	15/-	—	6	13	4
Hall Tel. Acc. (10/-)	10	10	10/-	—	10	0	0
Heatrae (2/-) ..	12½	12½	4/-	—	6	5	0
Henleys (5/-) ..	20	20	17/-	—	5	17	8
Holophane (5/-) ..	15	15	10/-	—		—	
Hoover (5/-) ..	37½	35*	24/9	+1/6	7	1	5

Company	Dividend Previous	Dividend Last	Middle Price 18th Aug. 1952	Week's Rise or Fall	Est. Yield p.c. £	s	d
Equipment and Manufacturing (continued)							
Intl. Combustion (5/-)	20	25	22/9	—	5	10	0
Johnson & Phillips	15	15	52/-	+2/-	5	15	5
Lancashire Dynamo	22½	12½*	43/9	—	5	14	2
Laurence, Scott (5/-)	12½	15	11/9	—	6	7	8
London Elec. Wire	10	12½	48/9	+½	5	2	6
J. Lucas	17½	7½*	32/6	—	4	12	4
Marryat & S. (2/-)	22½	22½	5/-	—	9	0	0
Mather & Platt ..	12½	12½	43/-	+6d	5	16	4
Metal Industries..	10	15	38/9	+1/-	7	14	10
Mid. Elec. Mfg. ..	15	15	55/-	—	5	9	0
Murex	12½	15	53/3	—	5	12	9
Newman Ind. (2/-)	6	10	2/6	—	8	0	0
Oldham & Son (1/-)	30	35	5/-	—	7	0	0
Parnall (Yate) (5/-)	6	6	3/3	—	10	0	0
Parsons, C. A. ..	15	10*	48/9	+⅛	4	2	0
Plessey (5/-) ..	20	22½	17/6	—	6	8	7
Pye Deferred (5/-)	35	18*	16/-	+6d	5	12	6
Revo (10/-) ..	27½	27½	38/3	—	6	10	9
Reyrolle	15	10*	44/6	—	4	10	0
Scot. Cable (4/-) ..	30	32	20/9	—	6	3	6
Siemens Ord. ..	10	10	33/-	+6d	6	1	2
Strand Elec. (5/-)..	17½	17½	8/9	—	10	0	0
Sturtevant (5/-) ..	16½†	17½*†	23/-	+1/-		—	
Switchgear & Cowans (5/-)	22½	22½	13/9	—	8	3	8
Taylor T. (5/-) ..	20	20	20/-	—	5	0	0
T.C.C. (10/-) ..	20	20*	36/3	—		—	
T.C. & M. ..	10	10	24/6	+6d		—	
Telephone Mfg. (5/-)	10	10	8/-	+3d	6	5	0
Thorn Elec. (5/-) ..	10	12½	8/6	—	7	7	0
Tube Investments	25	25	54/-	—		—	
Vactric (5/-) ..	Nil	Nil	4/6	—		Nil	
Veritys (5/-) ..	Nil	7½	4/3	—	8	16	6
Walsall Conduits (4/-)	70	70	45/9	+9d		—	
Ward & Goldstone (5/-)	44	45*	29/-	—		—	
Watford (2/-) ..	25	25	6/-	—	8	6	8
Westinghouse Brake	14	14	46/6	—	6	1	0
West, Allen (5/-) ..	12½	15	47/6	+1/-	5	17	5
Trusts, Transport and Communications							
Anglo-Am. Tel.: A Ord.	—	4½	77½	—	5	16	2
Ord.	—	56/3	48	−2	5	17	2
Anglo-Portuguese	8	8	20/6	—	7	16	2
Brit. Elec. Traction: Def. Ord. ..	22½	25	405	—	6	2	6
Cable & Wireless: Ord.	6	8	112½	+1	7	2	3
4% Loan ..	4	4	96	—	4	3	4
Calcutta Trams ..	6†	6†	23/6	—	5	2	2†
Cape Elec. Trams	4	5	12/6	—	8	0	0
Marconi Marine ..	7½	10	28/-	—	7	2	10
Oriental Tel. Ord.	16	16	55/-	—		—	
Telephone Props.	8	8	31/3	+½	5	2	5
Tele. Rentals (5/-)	10	10	8/-	—	6	5	0

* After capital bonus.
† Dividends are paid free of Income Tax.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 1st October from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1946

11226. Marconi's Wireless Telegraph Co., Ltd.—Cathode-beam tubes. 11th April, 1946. (680420.)

1947

1361. Philips Lamps, Ltd.—Magnetic ferrite materials for magnetic cores. 15th January, 1947. (680320.)

34813. Staatsbedrijf der Posterijen Telegrafie en Telefonie.—Release signal system for telegraph exchange systems. 30th December, 1947. (680103.)

1948

19476. Nielsen Co., A. C.—Recording apparatus more particularly for determining the listening habits of users of radio receivers. 20th July, 1948. (680323.)

1949

413. Wilkinson High Frequency, Ltd.—Aerial devices. 16th February, 1950. (680280.)

4131. British Thomson-Houston Co., Ltd.—Methods of improving the corrosion resistance of ferrous articles. 15th February, 1949. (680281.)

5139. Telegraph Construction & Maintenance Co., Ltd.—Cable manufacturing machine. 24th February, 1950. (680329.)

7757. Philips Electrical, Ltd.—Resilient supports for apparatus. 22nd March, 1949. (680282.)

9120. British Thomson-Houston Co., Ltd., Ruff, H. R., and Wells, R. S.—Fluorescent coatings of fluorescent electric discharge lamps. 24th March, 1950. (680284.)

9125. Metropolitan-Vickers Electrical Co., Ltd.—Betatrons. 20th March, 1950. (680002.)

11686. British Thomson-Houston Co., Ltd.—Automatic regulating systems. 2nd May, 1949. (680209.)

12395. Electric & Musical Industries, Ltd.—Television cameras. 1st May, 1950. (680112.) 12396. Television apparatus. 26th April, 1950. (680113.) 13070. Television apparatus. 4th May, 1950. (680114.)

16450. Foster Transformers & Switchgear, Ltd., and Bagnall, R. I.—Electrically-operated time delay devices. 20th June, 1950. (680336.)

17087. British Thomson-Houston Co., Ltd.—Methods of and apparatus for forming silica and for coating lamp bulbs. 28th June, 1949. (680217.)

18148. Edison Swan Electric Co., Ltd.—Electronic counting apparatus. 6th July, 1950. (680340.)

21988. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Magnetic induction accelerators for electrons. 24th August, 1949. (680008.)

22235. English Electric Co., Ltd.—Control systems for electrically propelled vehicles. 28th August, 1950. (680289.)

22882. General Radiological, Ltd., and Brod, S.—Apparatus for high-frequency therapeutic and other treatment. 4th December, 1950. (680011.)

24178. Philips Electrical, Ltd.—Electric-discharge tubes. 23rd September, 1949. (680012.)

26460. General Electric Co., Ltd., and Gordon, G.—Quenching apparatus. 16th October, 1950. (680016.)

28389. Hall Telephone Accessories, Ltd., and Automatic Telephone & Electric Co., Ltd.—Coin-freed telephone or radio-telephone apparatus. 26th October, 1950. (680352.)

29155. British Thomson-Houston Co., Ltd., Bowen, A., and Bulleid, D. L.—Film gates for kinematograph machines. 14th September, 1950. (680353.)

29740. Hutchins Electric Co., Inc.—Electric motor. 21st November, 1949. (680137.)

30076. Automatic Telephone & Electric Co., Ltd.—Electrical signalling and indicating arrangements. 25th October, 1950. (680295.)

30492. Luraschi, A. G.—Temperature-responsive switches. 27th November, 1950. (680296.)

30889. British Insulated Callender's Cables, Ltd., and Mann, C. A.—Electrically-actuated valve for the control of fluid. 30th November, 1950. (680020.)

1950

1975. Hoover (Washing Machines), Ltd., Bell, W. C., Buttrey, R. N., Dunn, H. G., and Haydon, E. K.—Washing machines. 19th January, 1951. (680023.)

2387. British Thomson-Houston Co., Ltd., Clarke, M. G., and Privett, H. L.—Operation of electric-discharge lamps. 12th January, 1951. (680362.)

2406. General Electric Co., Ltd., Martin, D. E., and Dawkins, R. A.—High-frequency electric heating apparatus. 30th January, 1951. (680140.)

4208. Electric & Musical Industries, Ltd.—Television and like receiving aerials. 19th February, 1951. (680299.)

4460. Communications Patents, Ltd.—Wired broadcasting. 21st May, 1951. (680028.)

4722. Metropolitan-Vickers Electrical Co., Ltd.—Magnetic electron lenses. 4th December, 1950. (680300.)

5079. Dubilier Condenser Co. (1925), Ltd.—Electrical condensers. 26th January, 1951. (680030.)

5360. Standard Oil Development Co.—Electrical process for breaking emulsions. 2nd March, 1950. (680244.)

5414. Gloess, P. F. M.—Electric signalling systems by means of position modulated pulses. 3rd March, 1950. (680301.)

7181. General Electric Co., Ltd., and Hayes, A. G.—Electrical light valve devices. 26th April, 1951. (680246.)

8128. Suddeutsche Apparatefabrik Ges.—Arrangement for the complex balance of telephone cables by means of screened balancing elements. 31st March, 1950. (680150.)

9265. Siemens & Halske Akt.-Ges.—Electron-discharge tubes and circuit arrangements for such tubes. 14th April, 1950. (680303.)

9707. Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz.—Television pick-up tubes. 20th April, 1950. (680153.)

11035. Philco Corporation.—Electrical circuit devices adapted to be secured to a panel or other supporting structure. 4th May, 1950. (680304.)

15244. Measurement, Ltd.—Brake magnet units for electricity meters. 25th May, 1951. (680160.)

15313. Metropolitan-Vickers Electrical Co., Ltd.—Pulse shaping circuits employing electronic discharge tubes. 18th June, 1951. (680256.)

15903. Metropolitan-Vickers Electrical Co., Ltd.—Sealing gland arrangements. 23rd May, 1951. (680045.)

16695. Philips Electrical Industries, Ltd.—Inductance coils. 4th July, 1950. (680164.)

17043. Igranic Electric Co., Ltd.—Door interlocks for enclosing cabinets. 7th July, 1950. (680165.)

17204. Ceskoslovenske Zavody Tezkeho Strojirenstvi Narodni Podnik, and Svoboda, V.—Welding dynamo. 10th July, 1950. (680166.)

19567. Metropolitan-Vickers Electrical Co., Ltd.—Torches for gas-blanketed arc welding. 4th August, 1950. (680170.)

19896. Alkaline Batteries, Ltd.—Magnetically operated locking devices. 18th July, 1951. (680059.)

20871. Hoover, Ltd.—Suction cleaners. 23rd August, 1950. (680315.)

23212. Philips Electrical Industries, Ltd.—Television receivers. 21st September, 1950. (680318.)

23333. Metropolitan-Vickers Electrical Co., Ltd.—Manufacture of coiled ducting. 24th April, 1951. (680382.)

23884. Western Electric Co., Inc.—Electrical pulse circulating apparatus. 29th September, 1950. (680319.)

24575. Scholes & Co., Ltd., G. H., and Pearce, G. S.—Electric switches and contact arrangements therefor. 4th July, 1951. (680071.)

26000. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Electron-discharge tubes. 25th October, 1950. (680076.)

26676. Centre National de la Recherche Scientifique.—Electrostatic generators. 1st November, 1950. (680178.)

28967. British Thomson-Houston Co., Ltd.—Automatic flatplate ironers. 27th November, 1950. (680079.)

29445. Laval Separator Co.—Dynamo-electric machine. 1st December, 1950. (680081.)

29712. American Gas Accumulator Co.—Electrical transformers. 5th December, 1950. (680395.)

30771. Telefonaktiebolaget L. M. Ericsson.—Cross-bar switches. 18th December, 1950. (680083.)

1951

316. Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz.—Cathode-ray tubes or the like. 4th January, 1951. (680402.)

954. Standard Telephones & Cables, Ltd.—Directive radio stations. 12th January, 1951. (680084.)

1945. British Thomson-Houston Co., Ltd.—Driving mechanisms. 25th January, 1951. (680274.)

2538. Keller, B.—Electrical terminal blocks. 1st February, 1951. (680406.)

2857. Zechel, R. F.—Electric battery connectors. 6th February, 1951. (680086.)

7205. Telefonaktiebolaget L. M. Ericsson.—Electric controlling system. 28th March, 1951. (680193.)

EXPORTS FROM SWITZERLAND

THE electrical exports of Switzerland registered further expansion last year, particularly the machinery group. Telegraph, telephone and radio goods were also in increased demand. In most lines Holland figured as a growing customer. The accompanying table shows the values of the principal groups and some of the leading destinations.

Class of Goods	1951 fr. (000)	Inc. or dec. on 1950 fr. (000)
Accumulators	3,372	+ 209
To France	550	— 626
„ *Italy*	84	— 251
„ *Belgium*	307	+ 125
„ *Finland*	300	+ 281
„ *Holland*	224	+ 102
Insulators	2,039	+ 115
To Belgium	163	— 206
„ *Holland*	414	+ 25
„ *Germany*	289	+ 202
„ *Poland*	275	+ 246
Meters and measuring instruments	28,562	— 550
To France	2,056	— 1,490
„ *Italy*	2,175	— 773
„ *Belgium*	2,151	— 260
„ *Holland*	5,069	+ 1,613
„ *Sweden*	1,937	— 33
„ *India*	1,096	— 216
Dynamo electric machines	121,731	+ 22,289
To Germany	7,335	+ 5,519
„ *France*	7,891	— 711
„ *Spain*	4,389	— 354
„ *Poland*	3,427	— 543
„ *Czechoslovakia*	8,699	+ 1,231
„ *Belgium*	7,228	— 1,649
„ *Finland*	2,255	— 1,822
„ *Holland*	8,645	+ 4,759
„ *Norway*	3,334	— 1,780
„ *Argentina*	3,581	— 5,301
„ *Brazil*	16,015	+ 12,090
„ *Peru*	3,096	— 1,141
„ *Portugal*	2,068	— 1,168
„ *India*	2,129	— 109
„ *Yugoslavia*	3,657	+ 3,311
Electric locomotives	7,730	— 1,734
To Thailand	1,465	+ 1,018
„ *French Africa*	6,258	— 281
Telegraph and telephone apparatus	10,754	+ 2,928
To Holland	5,656	+ 2,885
„ *Israel*	1,877	+ 939
„ *Italy*	613	— 362

Class of Goods	1951 fr. (000)	Inc. or dec. on 1950 fr. (000)
Radio apparatus	15,592	+ 4,396
To Germany	3,084	— 525
„ *Italy*	1,168	+ 477
„ *Belgium*	2,082	+ 1,484
„ *Holland*	1,193	+ 526
„ *Argentina*	1,506	+ 1,452
Electric incandescent lamps	824	+ 65
To Germany	195	— 185
Unspecified electrical apparatus over 500 kg	27,999	+ 4,939
To Holland	3,377	+ 1,997
„ *Norway*	1,434	+ 627
„ *Spain*	1,337	+ 339
„ *Poland*	1,455	+ 300
„ *France*	1,709	— 840
„ *Belgium*	2,054	+ 14
„ *Brazil*	1,952	+ 1,532
„ *Argentina*	1,079	— 532
„ *Australia*	1,264	+ 1,088
„ *Portugal*	972	— 1,003
Unspecified electrical apparatus 50 to 500 kg	23,790	+ 2,980
To Belgium	1,526	— 705
„ *Germany*	819	+ 379
„ *Holland*	2,020	+ 639
„ *Poland*	1,473	+ 1,105
„ *France*	1,076	— 603
„ *Yugoslavia*	1,960	+ 1,716
„ *Israel*	567	+ 447
„ *Brazil*	2,123	+ 1,550
„ *Sweden*	1,482	+ 712
Ditto 3 to 50 kg	21,597	+ 134
To France	2,483	— 275
„ *Belgium*	1,648	— 371
„ *Holland*	2,265	+ 556
„ *Spain*	830	— 185
„ *Italy*	1,174	+ 56
„ *Germany*	906	+ 357
„ *Brazil*	1,439	+ 263
Ditto 0·3 to 3 kg	12,140	+ 317

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Consett (Durham).—13th September. U.D.C. Electric lighting in 34 houses at Riverside, Shotley Bridge. E. Simpkin, surveyor, Council Offices.

Dover.—9th September. Corporation. Street lighting equipment. (See this issue.)

India.—DELHI.—9th September. Directorate of Supplies and Disposals. Pumping sets, transformers and switchgear for the Central Railway, Bombay. (C.R.E. 27622/52. Ten/4465.)*

BANGALORE.—11th September. Stores Purchase Committee, Government of Mysore. Pole-mounted non-automatic oil circuit breakers. (C.R.E. 27713/52. Ten/4479.)*

Newcastle-on-Tyne.—Tyne Improvement Commission. H.v. cables, etc., for a new sub-station at White Hill Point, Albert Edward Dock, North Shields. Commission's chief engineer, Bewick Street.

New Zealand.—WELLINGTON.—18th September. N.Z. Post Office. Fuses, fuse-holders and fuse terminals. (C.R.E. 27694/52. Ten/4466.)*

1st October. Post and Telegraph Department. Supply of 250 d.c. milliammeters. (C.R.E. 27760/52. Ten/4483.)*

Northumberland.—Education Committee. Electric lighting in Blyth New Delaval County Mixed School and caretaker's house. County architect, County Hall, Newcastle-on-Tyne.

Ryton-on-Tyne.—U.D.C. Electrical installations in 16 houses at Crawcrook. Surveyor, Council Offices.

South Africa.—JOHANNESBURG.—3rd September. South African Railways. Supply of 135 yard lighting lanterns. (C.R.E. 27643/52. Ten/4474.)*

PRETORIA.—4th September. Union Tender and Supplies Board. P.v.c. insulated and p.v.c. sheathed indoor cable. (C.R.E. 27642/52. Ten/4468.)*

CAPE TOWN.—1st October. Electricity Department. Mercury arc rectifying equipment. (C.R.E. 27963/52. Ten/4482.)*

Stepney.—3rd September. Borough Council. Five electric passenger lifts at Cornwall Street housing scheme. Borough engineer, Commercial Road, E.1.

Windsor.—2nd September. R.D.C. Wiring of 40 houses on sites at Old Windsor, Sunningdale and Sunninghill. Surveyor, Bowden Road, Sunninghill.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Horse Guards Avenue, Whitehall, S.W.1 (Trafalgar 8855).

ORDERS PLACED

Bridgwater.—Town Council. Street lighting, Hamp and Sydenham estates (£1,197).—G.E.C.

Hull.—Corporation. Electrical installations in 75 houses on the Bilton Grange estate, Scheme 22AC (£2,227) and 22 dwellings, Scheme 22AB (£560).—J. Todd. Installations in 34 dwellings at New George Street and Sykes Street, Building Scheme 46 (£1,269), 93 houses at Bilton Grange, Scheme 22AF (£2,784) and 21 dwellings at Bilton Grange, Scheme 222AA (£582).—Reliance Electrical Co., Ltd. Electric lighting and power installation at Sutton Road Junior and Infants' School (£2,105).—T. A. Garness, Ltd.

Liverpool. — Corporation. Recommended. Alterations and renewal of electrical wiring installations at the Smithdown Road Garage of passenger transport undertaking (£792).—H. C. Woolliscroft & Co.

London.—L.C.C. The following contracts exceeding £2,500 in value for electrical installations in schools have been placed during the month ended 17th July: George Lansbury County Primary.—L.S.P. Electrical Co. Heber County Primary, Dulwich.—Honor Bros., Ltd. Canterbury Road County Primary, Deptford.—W. M. Grant & Co. Virginia County Primary, Bethnal Green.—Norwest Services, Ltd. Christopher Hatton County Primary, Holborn.—Holmes & Larkinson

West Hartlepool.—Corporation. Electrical equipment in connection with proposed improvements to street lighting. Totally enclosed type lanterns; Revo Electric Co. Open-type lanterns; B.T.H. Co. Transformers and capacitors; Metropolitan-Vickers.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barnard Castle.—Houses (43) at Green Lane, Barnard Castle, for the North-Eastern Housing Association, Northumberland Road, Newcastle-on-Tyne.

Birmingham.—Modernization of Bradford Street meat market and new toll market in Jamaica Row with underground car park; H. J. Manzoni, city engineer.

Alterations and adaptations at Cateswell Road, Hall Green, for Rockwell Machine Tool Co., Ltd.; Wm. J. Green & Associates, architects, Brook House, Brook Lane, King's Heath, Birmingham.

Blackpool.—Extension, St. Joseph's College; Wm. Eaves & Co., Ltd.

Blaina.—Additional accommodation at Glanyrafon Secondary Modern School; Colin L. Jones, architect, Queen's Hill, Newport, Mon.

Bradford.—Rebuilding Rawson Market Place in two stages (£152,000); W. H. Leathem, town clerk.

Bristol.—Primary school, Manor Farm, Horfield; city architect.

Broughton (Lancs).—Redevelopment of fire brigade headquarters, including erection of firemen's houses; county architect, Preston.

Bury.—Rebuilding of Unitarian Chapel at Stand; P. Hamer, Ltd., Swinton.

New R.C. church at Fairfield; T. Powell, Tong Moor, Bolton.

Carlisle.—Houses (68) at Harraby for the City Council; J. Laing & Sons, builders, Dalston Road.

Consett.—New housing estate (450 houses and six shops) at Gloucester Road, Delves Lane, for the U.D.C.; J. J. Eltringham, architect, Derwent Street, Blackhill.

Croydon.—Lanfranc Secondary Boys' School for E.C.; Riches & Blythin, architects, 16, Northumberland Avenue, W.C.2.

Cumberland.—Rural police stations for the C.C. at Thursby, Flimby, Hallbankgate, Cummersdale, Allonby, Castle Carrock, Crosby-on-Eden and Plumpton; county architect, Portland Square, Carlisle.

Fire station and ten firemen's houses at Hensingham for the C.C. (£46,000); county architect.

Dartford.—Houses (94), at Temple Hill (£109,232), for T.C.; Hawker-Smith, Ltd., builders, Rochester Way, Bexley.

Denton.—Further 48 houses at Haughton Hall site for U.D.C.; surveyor, Town Hall.

Durham.—Pithead baths at Houghton Meadows Colliery; N.C.B. Architects' Dept., Ashfield Tower, Gosforth, Newcastle-on-Tyne

Temporary school at Barnard Castle Stainton Camp for the C.C. (£6,500); county architect, Court Lane.

Additions to the central repair depot for the C.C. (£12,000 including £3,000 for plant, etc.); county architect.

Edinburgh.—Development of estate at Sighthill, with provision for houses, shops, cinema and other public buildings; city engineer, 329, High Street.

Hitchin.—Houses (55), on estate at Codicote, near Welwyn; B. Ewing, R.D.C. surveyor, Bancroft.

Ilford.—Flats (72), Marks Gate estate; borough engineer.

Leamington Spa.—Workshop block in grounds of Thornbank House, Warwick Road (£49,000), as first stage of college of further education; Warwicks county architect.

London.—CLAPHAM.—Flats (144), Clapham Road, for Wandsworth B.C.; C. H. James, architect, 5, Bloomsbury Street, W.C.1.

HAMMERSMITH.—Eight shops and 18 flats, Spring Vale estate; borough engineer.

Middlesbrough.—Works additions in Grange Road for Olivers Garages, Ltd.; Kitching & Co., architects, 21, Albert Road.

Nantwich.—X-ray dept. at Barony Hospital; Manchester Regional Hospital Board, 1, North Parade, Manchester.

Newcastle-on-Tyne.—Extensions to factory, West Road; Hadden & Hillman, New Bridge Street, Newcastle.

Northallerton.—Laboratory; Milk Marketing Board, Giggs Hill Green, Thames Ditton.

Oxford.—College of further education (about £240,000); E. G. Chandler, city architect, Town Hall.

Penzance.—Three-storey flats, St. Clare Street; borough engineer.

Peterborough.—Home for old people, Thorpe Road (£30,381); H. J. Firman, Oxney Road.

Romsey (Hants).—Houses (57), Priestlands; borough surveyor, Town Hall.

Rothbury.—Houses (30), Beggars Rigg, for R.D.C.; J. M. Oliver, surveyor.

Sedgley.—Sewage pumping station, Cinder Road; U.D.C. surveyor.

Sevenoaks.—Housing scheme, Greatness Lane; G. T. Bradbury, clerk, Argyle Road.

Staveley.—Houses (42), Inkersall Green estate; U.D.C. architect.

Stockport.—R.C. church, Stockport Road; Reynolds & Scott, architects, 9, Albert Square, Manchester.

Stockton-on-Tees.—Partial rebuilding of premises for the Quayside Engineering Co., Ltd.; own architects.

Stourport.—Six shops with flats and maisonnettes, Walshes Farm estate; Godwin, Clist & Greenway, architects, Bank Buildings, Kidderminster.

Stratford-on-Avon.—Houses (23), bungalows and shop, at Bearley; F. W. B. Yorke & Co., architects to R.D.C., 191, Corporation Street, Birmingham, 4.

Sunderland.—Additions to Pallion Engine Works for William Doxford & Sons; Brims & Co., Ltd., Pandon Buildings, Newcastle-on-Tyne.

Tipton.—Houses (66), Park Lane West; housing architect, Municipal Buildings, Sedgley Road West.

Tividale (Staffs).—Comprehensive school on site off City Road; County Education Offices, Green Hall, Lichfield Road, Stafford.

Tunbridge Wells.—Houses (76), Sherwood estate; borough surveyor, Town Hall.

Twickenham.—Flats (207), Butts Farm estate (£372,920); Bunting Construction Co., Ltd., 71, Acre Lane, London, S.W.2.

Wakefield.—Schools, Eastmoor estate and Kettlethorpe; city engineer, Town Hall.

Flats, Gill Sike (32) and at Flanshaw (20); W. H. Nicholson & Sons, Ltd., Mafeking Works, Duke of York Street.

Worthing.—Houses (40) at Angmering and Sompting (£55,460), for R.D.C.; Greenways, Ltd., builders, Shoreham-by-Sea.